The Limestone Hiil Flora of Malaya III*

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Angiosperms — Dicotyledons *cont.*

INTRODUCTORY KEY TO RUBIACEAE

The numbers on the right hand side refer to the numbers in the subsequent main key with which one should continue.

1. Epiphytic, tuberous shrub .... *Hydnophytum formicarium.*
1. Not as above
    2. Scandent: climbers or twiners 3
    Morinda umbellata, Panderia tomentosa, Psychotria cantleyi, Psychotria sarmentosa.
    2. Erect: herbs, shrubs or trees
        3. Herbaceous, sometimes woody at the base
            4. Stem creeping 7
            Geophila repens, Hedyotis coronaria, Ophiorrhiza longerepens.
            4. Stem not creeping
                5. Corolla rotate, anthers connivent 11
                Argostemma pictum, A. diversifolium, A. inaequilaterum.
                5. Corolla and anthers different
                    6. Flowers secund, capsule usually obcordate 14
                    Ophiorrhiza spp.
                    6. Flowers differently arranged, capsule not obcordate 20
                    Oldenlandia spp., *Hedyotis* spp.
        3. Woody, shrubs or trees
            7. Sea-shore tree, leaves large, usually subcordate .... *Guettarda speciosa.*
            7. Not on sea-shores
                8. Flowers in dense heads, fruits compound 27
                Morinda elliptica, Nauclea junghuhnii, Neonauclea calycina.
                8. Flowers not in dense heads, fruits not compound.
                    9. Flowers in terminal inflorescences
                        10. Corolla tube 2-3 cm long, petals 4, style hardly projecting 31
                        Ixora spp.
                        10. Corolla tube very short, sometimes to 1.3 cm long, petals 4 to 5, style short or projecting to 2.5 cm
                            11. Leaves, lower surface pubescent 41
                            Psychotria rhinocerotis, Mycetia malayana, Pavetta naucleiflora, Tarenna appressa.
                            11. Leaves, glabrous

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* Parts I and II appeared in Gardens' Bulletin, XXX (1977) 165-219, and XXXII (1979) 64-203, respectively.

12. Style projecting 1-2.5 cm 45
Pavetta pauciflora, Pavetta indica.
12. Style not or hardly projecting 46
Tarenna spp., *Prismatomeris malayana, Becheria parviflora, Psychotria* spp.

9. Flowers in axillary inflorescences; if terminal, then only 1-3 flowers together

13. Lower surface of leaves pubescent 57
Lasianthus stipularis var. *hirtus, Petunga hirta, Urophyllum corymbosum, Canthium aciculatum, Timonius atropurpureus.*
13. Lower surface of leaves pubescent 57
Lasianthus stipularis var. *hirtus, Petunga hirta, Urophyllum corymbosum, Canthium aciculatum, Timonius atropurpureus.*

RUBIACEAE — MAIN KEY

1. Epiphytic, tuberous shrub .... *Hydnophytum formicarium*
Not as above 2

2. Scandent: climbers or twiners 3
Erect: herbs, shrubs or trees 6

3. Flowers in dense globose heads; fruits multiple .... *Morinda umbellata*
Flowers not in dense globose heads; fruits not multiple 4

4. Inflorescence ± 10 cm long, corolla ± 1 cm long .... *Paederia tomentosa*
Inflorescence smaller, corolla short: 0.3-0.4 cm long 5

5. Inflorescence compact; seeds with 3 ridges .... *Psychotria cantleyi*
Inflorescence spreading; seeds with 4 ridges .... *Psychotria sarmentosa*

6. Herbaceous, sometimes woody at the base 7
Woody, shrubs or trees 25

7. Stem, creeping, with ascending branches 8
Stem, erect 10

8. Leaves cordate .... *Geophila repens*
Leaves not cordate 9

9. Flowers in sessile heads; fruits subglobose or globose .... *Hedyotis coronaria*
Flowers not in heads; fruits oblong, broader than long, slightly obreniform .... *Ophiorrhiza longerepens*

10. Corolla rotate, anthers connivent; inflorescence terminal 11
Corolla and anthers different; inflorescence terminal or axillary 13

11. Leaves ovate or lanceolate, base narrowed, rarely rounded 12
Leaves broadly ovate or suborbicular, base rounded or cordate .... *Argostemma pictum*

12. Leaves ovate, broadest at the lower portion; 2-6 in a pseudowhorl .... *Argostemma diversifolium*
Leaves lanceolate, broadest at the middle or slightly above it, 6-10, at the top of stem .... *Argostemma inaequilaterum*

13. Flowers secund (on one side only) on inflorescence-branches; capsule compressed, usually obcordate 14
Flowers not so arranged; capsule ovoid, globose or otherwise shaped, not compressed or .... obcordate 20

14. Lower surface of leaves glabrous, or sometimes minutely pubescent on the veins only 15
Lower surface pubescent 17

15. Upper surface glabrous 16
Lower surface finely pubescent .... *Ophiorrhiza fruticosa*

16. Top of capsule broadly V-shaped; parts of plant drying pink. Common in Selangor .... *Ophiorrhiza discolor*
Top of capsule almost flat; plant not drying pink. Only from Kelantan .... *Ophiorrhiza remotiflora*

17. Upper surface of leaves pubescent; capsule golden-pubescent .... *Ophiorrhiza kunstleri*
Upper surface of leaves glabrous or glabrescent; capsule glabrous or glabrescent 18

18. Top of capsule depressed, capsule obcordate or obreniform 19
Top of capsule more or less flat .... *Ophiorrhiza communis*

19. Leaves with base tapered, both of a pair usually equal-sized .... *Ophiorrhiza hispidula*
Leaves, with base rounded or shortly cuneate, one of a pair usually smaller .... *Ophiorrhiza pallidula*

20. Flowers in axillary clusters, few or many to a cluster 21
Flowers in terminal, lax inflorescences 24

21. Capsule 4-winged, splitting horizontally above the calyx .... *Oldenlandia pterita*
Capsule not winged, splitting vertically 22

22. Leaves small, 1.5-5.0 cm long 23
Leaves bigger, 6-12 cm long .... *Hedyotis congesta*

23. Leaves thin, 0.5-1.2 cm wide, more or less hispid .... *Hedyotis verticillata*
Leaves coriaceous, 0.3-0.8 cm wide, glabrous .... *Hedyotis tenelliflora*

24. Anthers about 0.5 mm long .... *Oldenlandia ovatifolia*
Anthers about 1.25 mm long .... *Oldenlandia rosettifolia*

25. Sea-shore tree, leaves large, 10-25 by 8-18 cm, usually subcordate; fruits woody, ± 2.5 cm across .... *Guettarda speciosa*
Not on sea-shores (but sometimes on coastal limestone), leaves usually smaller, fruits different 26

26. Flowers in dense heads; fruit compound 27
Flowers not in dense heads though sometimes in compact clusters; fruit not compound 29

27. Heads oblong, bumpy, fleshy, axillary .... *Morinda elliptica*
Heads globose, not bumpy, dry, terminal 28

28. Heads small, ±1.2 cm across (in flower) and to 2 cm across (in fruit), ebracteate .... *Nauclea junghuhnii*
Heads larger, 2-3.5 cm across, subtended initially by a pair of large bracts .... *Neonauclea calycina*

29. Flowers in terminal clusters, spikes or panicles 30
Flowers in axillary clusters, spikes or panicles, or solitary; if terminal then only 1-3 together 56

30. Corolla-tube 2-3 cm long (0.8-1.3 cm in *Ixora nigricans*), petals 4, style short or projecting less than 0.6 cm 31
Corolla-tube very short, sometimes to 1.3 cm long and very rarely to 1.8 cm long, petals 4 or 5, style short or projecting to 2.5 cm 40

31. Leaves, lower surface pubescent 32
Leaves, lower surface glabrous 33

32. Sepals ovate, 0.6 cm long, known only from Pahang .... *Ixora clerodendron*
Sepals filiform, 0.2-0.5 cm long. Recorded from NW. Malaya, not known from Pahang .... *Ixora brunonis*

33. Corolla white or greenish, fragrant 34
Corolla yellow, pink or red, fragrant or not 36

34. Sepals oblong, 0.3-0.6 cm long .... *Ixora umbellata*
Sepals ovate-lanceolate, ±0.1 cm long 35

35. Leaf-base tapered; corolla-tube 0.8-1.3 cm long .... *Ixora nigricans*
Leaf-base usually rounded; corolla-tube 2-3 cm long .... *Ixora nigricans* var. *ovalis*

36. Corolla tube wholly yellow, pink or red, petals yellow or orange, changing to red 37
Corolla tube tinged pink or red, petals white or pinkish, colour not changing 39

37. Leaf-base tapered 38
Leaf-base cordate .... *Ixora scortechinii*

38. Leaves lanceolate 0.7-2.3 cm wide .... *Ixora lobbii* var. *stenophylla*
Leaves broadly elliptic, 5-15 cm wide .... *Ixora congesta*

39. Inflorescence erect, peduncle 5-9 cm long .... *Ixora grandifolia*
Inflorescence pendulous, peduncle to 28 cm long .... *Ixora pendula*

40. Leaves, lower surface pubescent, especially on the veins 41
Leaves glabrous 44

41. Pubescence rusty brown, upper surface of leaves glabrous, pale grey when dry; veins 12-15 pairs, raised and prominent on the lower surface .... *Psychotria rhinocerotis*
Pubescence not rusty brown and characters not so combined 42

42. Corolla-tube very short, 0.2 cm; fruits subglobose, white, pulpy; leaves membranous; twigs straw-coloured .... *Mycetia malayana*
Corolla-tube longer, 0.7-1.3 cm; fruits not white and pulpy 43

43. Style projecting 1.2cm beyond the corolla tube, corolla lobes 4; leaves membranous .... *Pavetta naucleiflora*
Style not projecting beyond the corolla-tube, corolla-lobes 5, sometimes 4; leaves thinly coriaceous .... *Tarenna appressa*

44. Style projecting 1-2.5 cm beyond the corolla-tube, leaves thin; corolla-tube about 1.2 cm long ... 45
Style not or hardly projecting; leaves various; corolla-tube usually shorter 46

45. Cymes lax, peduncle 4 cm long; endemic to Gua Batu, Selangor .... *Pavetta pauciflora*
Cymes dense, peduncles less than 4 cm; common in lowland forest, on limestone in Perlis .... *Pavetta indica*

46. Corolla-lobes contorted or imbricated (see in bud) 47
Corolla-lobes valvate (see in bud) 51

47. Corolla-tube 1-1.2 cm long; leaves broadly lanceolate-obovate .... *Tarenna pulchra*
Corolla-tube less than 0.5 cm long 48

48. Leaves elliptic, elliptic-lanceolate, lanceolate-obovate or oblong-lanceolate 49
Leaves ovate-cuspidate .... *Tarenna calcarea*

49. Leaves smallish, 2-9 cm long 50
Leaves large, 13-18 cm long .... *Tarenna ridleyi*

50. Corolla-lobes contorted .... *Tarenna curtisii*
Corolla-lobes imbricate .... *Tarenna angustifolia*

51. Corolla-tube less than 0.5 cm long 52
Corolla-tube 1.2-1.8 cm long .... *Prismatomeris malayana* (in part)

52. Style bifid 53
Style not bifid, more or less clubbed .... *Becheria parviflora*

53. Corolla lobes 5 54
Corolla lobes 4 .... *Psychotria rostrata*

54. Seeds with 1 ridge, sometimes very faint 55
Seeds with 5 ridges .... *Psychotria viridiflora*

55. Leaves membranous; ridge very faint .... *Psychotria montana*
Leaves coriaceous; ridge prominent .... *Psychotria angulata*

56. Leaves on lower surface pubescent, sometimes on the veins only 57
Leaves on lower surface glabrous, rarely with small tufts of hair in the axil of lateral veins 61

57. Leaves exceeding 10 cm long 58
Leaves 3-8 cm long 60

58. Flowers surrounded by numerous lanceolate hairy bracts .... *Lasianthus stipularis*
Flowers not surrounded by such bracts 59

59. Flowers in short spikes; leaves about 11 cm long .... *Petunga hirta*
Flowers in umbelled cymes; leaves 12-25 cm long .... *Urophyllum corymbosum*

60. Leaves pubescent, also with needle-like spins .... *Canthium aciculatum* (in part)
Leaves pubescent, without spines, thin, surface uneven when dry; fruit on a stalk 1.5-2.5 cm long .... *Timonius atropurpureus*

61. Both leaves of a pair the same size 62
One leaf of a pair smaller; flowers 1-2 together, terminal or in the axils of the terminal pair of leaves .... *Amaracarpus saxicola*

62. Length of leaves double the width or less 63
Length of leaves usually exceeding 2.5 times the width 64

63. Shrub, spiny; fruits 0.6 cm long .... *Canthium aciculatum* (in part)
Tree or shrub, not spiny; fruits 0.7-1.3 cm long .... *Canthium didymum*

64. Corolla-tube 0.5 cm or more long 65
Corolla-tube very short; fruit bright orange .... *Urophyllum glabrum*

65. Leaves 6-12 cm long 66
Leaves 15-30 cm long 67

66. Pedicels 1.2-2 cm long; fruits 0.6 cm across; a shrub .... *Prismatomeris malayana* (in part)
Pedicels very short: 0.1-0.3 cm long; fruits 0.6-1.1 cm across; a tree .... *Randia densiflora*

67. Corolla tube 0.9-1.2 cm long, lobes 5-7, longer than or as long as the tube; fruits 0.8-1.5 cm long .... *Coffea canephora*
Corolla tube longer, lobes 5, shorter than the tube; fruits smaller .... *Coffea malayana*

Amaracarpus saxicola Ridl., J. Str. Br. As. Soc. 61 (1912) 22; Fl. 2 (1923) 172; Henders., J. Mal. Br. R. As. Soc. 17 (1939) 48.

Shrub 1-2 m tall. Leaves mostly in unequal pairs, subcoriaceous, glabrous, ovate, ovate-elliptic, elliptic or elliptic-lanceolate, 2.5-7 by 1-3 cm; petiole: 0.1-0.3 cm long; stipules toothed. Flowers solitary in the axils of terminal pairs of leaves, small and white. Fruit oblong or obovate, deep blue when ripe.

Endemic and restricted to limestone. Rare. Previously known only from Kamuning, Perak, now recorded from Kelantan and Pahang.

Argostemma diversifolium Ridl., J. Str. Br. R. As. Soc. 57 (1910) 52; Fl. 2 (1923) 23; Craib, Fl Siam 2 (1923) 28; Henders., J. Mal. Br. R. As. Soc. 17 (1939) 48.

Succulent herb to 1.5 m tall. Leaves 2-6 in a pseudowhorl, two of a pair often slightly unequal in size, ovate-acute or ovate-lanceolate, glabrous, dark-green above and pale below, 5-12 by 3-7 cm. Cymes terminal, 4-7 cm long, lax. Pedicels 1.2 cm long, stamens 0.8 cm long, longer than petals.

Distributed in Peninsular Thailand. In Malaya, known from a single specimen from Lenggong limestone in Perak (Ridley 14479). A rare and relatively unknown plant.

Argostemma inaequilaterum Benn., Pl. Jav. Rar. 1 (1838) 95; Ridl., Fl. 5 (1925) 314; Henders., J. Mal. Br. R. As. Soc. 17 (1939) 49.
A. acuminatum King, in Ridl., Fl. 2 (1923) 23.

Endemic and rare, recorded on limestone from Perak and Selangor and once (not limestone) from Penang.

Argostemma pictum Wall., in Roxb., Fl. Ind. 2 (1824) 327; Hk.f., F.B.I. 3 (1880) 43; Ridl., Fl. 2 (1923) 24; Craib. Fl. Siam 2 (1932) 30; Henders., J. Mal. Br. R. As. Soc. 17 (1939) 49.

Succulent herb to 12 cm tall. Leaves usually 4 of which 2 are small and 2 large, broadly ovate to suborbicular; base broad or subcordate; 2.5-9 by 3-6 cm. Flowers in terminal umbels. Anthers 5, connate.

Distributed in Phuket, Peninsular Thailand. Uncommon in Malaya, ofen on limestone.

Bacheria parviflora Ridl., J. Str. Br. R. As. Soc. 61 (1912) 20; Fl. 2 (1923) 21; Henders., J. Mal. Br. R. As. Soc. 17 (1939) 49.

Canthium aciculatum Ridl., J. Str. Br. R. As. Soc. 57 (1910) 57, Fl. 2 (1923) 124; Henders., J. Mal. Br. R. As. Soc. 17 (1939) 49.

Shrub; finely appressed hairy and with needle-like spines up to 1.2 cm long. Leaves ovate or lanceolate, base round, about 5 by 2.5 cm. Flowers small, in axillary cymes of 2-3 together. Calyx cupular, corolla-tube silky hairy. Berry 0.6 cm long.

Endemic to limestone, Known from Lenggong, Perak; Gunong Keriang, Kedah and Kelantan.

Canthium didymum Roxb., Fl. Ind. 1 (1832) 535; Hk.f., F.B.I. 2 (1880) 132;

Coffea canephora Pierre ex Froehner, sensu Purseglove, Trop. Crops Dicots. 2 (1968) 482.
C. robusta Lind., in Corner, Ways. Trees 1 (1952) 537; Burkill, Dict. Econ. Prod. Mal. 1 (1966) 636.

Native to tropical Africa. Now cultivated over most of the Tropics especially in Asia and Africa. What appears to be this species has been recorded from the lower slopes of Gunong Pondok. There is a patch of about 30-50 square metres on the broad saddle of this hill facing the main road that passes Padang Rengas, Perak. The soil here is a rich rusty red and fairly abundant. The trees occur in an almost pure stand and were apparently healthy; 3-7 m tall and fruiting and flowering sparingly when found (12th March 1971). How they reached there is a mystery. The local residents we met informed us that there is no coffee cultivation anywhere nearby which could have provided the source of this stand, neither do they know of the existence of these trees. Nevertheless they are probably escapes from cultivation, perhaps from a distance away or perhaps from nearby cultivation unknown to the residents we inquired from. Whatever the origin, the trees certainly deserve a further investigation.

Coffea malayana Ridl., J. Str. Br. R. As. Soc. 61 (1912) 19, Fl. 2 (1923) 111; Henders., J. Mal. Br. R. As. Soc. 17 (1939) 49.

Endemic, not common, in lowland forest. Once from limestone on Gunong Pondok, Perak *(Henderson 23808).*

Geophila repens (L.) Johnston, Sargentia 8 (1949) 281; Back. & Bakh. f., Fl. Java 2 (1965) 334.
G. herbacea (Jacq.) O.K., Rev. Gen. P1. (1891) 300; Craib, Fl. Siam 2 (1934) 205; Henders., J. Mal. Br. R. As. Soc. 17 (1939) 49.
G. reniformis Don, Prodr., Fl. Nepal (1825) 136.
Rondeletia repens L., Syst. ed. 10 (1789) 928.

Guettarda speciosa L., Sp. Pl. (1753) 991; Ridl., Fl. 2 (1923) 112. Henders., J. Mal. Br. R. As. Soc. 17 (1939) 49; Stone, Micronesica 6 (1970) 544.

Distributed along the coasts of Tropical Asia, East to the Pacific Islands and North to Taiwan. Recorded from coastal limestone in Langkawi.

Hedyotis congesta R. Br. ex Don, Gen. Syst. 3 (1834) 526; Ridl., Fl. 2 (1923) 51.

Hedyotis coronaria (Kurz) Craib, Fl. Siam, 2 (1932) 38; Henders., J. Mal. Br. R. As. Soc. 17 (1939) 49.
H. coronata Wall., in Ridl., Fl. 2 (1923) 48.

Slender decumbent herb, 15-20 cm tall. Leaves oblong-acuminate, glabrous except for the puberulent midrib below, 4-6.5 by 0.8-2 cm. Inflorescence in a terminal head of 4 leaves, sessile. Calyx-lobes lanceolate. Corolla 0.6 cm long. Fruit ellipsoid, many-seeded.

Distributed in Burma, SE. China and Thailand. Not uncommon in lowland to hill forest in Malaya. Often on limestone.

Hedyotis tenelliflora B1., Bijdr. (1826) 971; Ridl., Fl. 2 (1923) 51; Craib, Fl. Siam 2 (1932) 49; Henders., J. Mal. Br. R. As. Soc. 17 (1939) 49; 2 (1932) 49.

Hedyotis verticillata (L.) Lamk., Tabl. Encycl. 1 (1791) 271; Craib, Fl. Siam 2 (1932) 51.
H. hispida Retz., in Ridl., Fl. 2 (1923) 52.
Oldenlandia verticillata Linn., in Henders., J. Mal. Br. R. As. Soc. 17 (1939) 50.

Hydnophytum formicarum Jack, Trans. Linn. Soc. 14 (1823) 124; Ridl., Fl. 2 (1923) 172; Henders., Mal. Wild Fls. Dicots. (1959) 225.

Ixora brunonis Wall. ex Don, Gen. Syst. 3 (1834) 573; Ridl., Fl. (1923) 91; Craib, F1. Siam 2 (1934) 151; Henders., J. Mal. Br. R. As. Soc. 17 (1939) 49; Corner, Gard. Bull. S. S. 11 (1941) 183.

Ixora clerodendron Ridl., Trans. Linn. Soc. 3 (1893) 311, Fl. 2 (1923) 91; Henders., J. Mal. Br. R. As. Soc. 17 (1939) 49; Corner, Gard. Bull. S. S. 11 (1941) 185.

A small, little branched shrub. Leaf lanceolate or obovate, glabrous above, pubescent beneath, 23 by 9 cm. Inflorescence a terminal corymb, 2.5 cm across; corolla white, 2.5 cm long, lobes 0.3 cm long. Fruit 0.6 cm long.

Endemic and rare, usually on limestone, and known only from Pahang.

Ixora congesta Roxb., Fl. Ind. 1 (1820) 397; Ridl., Fl. 2 (1923) 93; Craib, Fl. Siam (1934) 154; Henders., J. Mal. Br. R. As. Soc. 17 (1939) 49; Corner, Gard. Bull. S.S. 11 (1941) 189.

Ixora grandifolia Zoll. & Mor., Syst. Verz. (1846) 65; Corner, Gard. Bull. S.S. 11 (1941) 197.
I. crassifolia Ridl., Fl. 2 (1923) 98.
I. elliptica Ridl., l.c. 98.
I. fluminalis Ridl., l.c. 97.

Ixora lobbii King et Gamble, Mats. 15 (1904) 78; Corner, Gard. Bull. S.S. 11 (1941) 216.
var. *stenophylla* Corner, l.c. 216.
I. stenophylla (Korth.) Kuntze sensu Ridley, Fl. 2 (1923) 94.

Ixora nigricans Wight & Arn. Prodr. Fl. Ind. 1 (1834) 428; Henders., J. Mal. Br. R. As. Soc. 17 (1939) 49; Corner, Gard. Bull. S.S. 11 (1941) 223.
var. *ovalis* Pitard, Fl. Gen. Indoch. 3 (1924) 322; Corner, Gard. Bull. S.S. 11 (1941) 224.

Ixora pendula Jack, Mal. Misc. 1 (1820) 11; Ridl., Fl. 2 (1923) 95; Craib, Fl. Siam 2 (1934) 164; Henders., J. Mal. Br. R. R. As. Soc. 17 (1939) 49; Corner, Gard. Bull. S.S. 11 (1941) 226.
I. pendula var. *opaca* Ridl., l.c. 96.

Ixora scortechinii K. & G., Mats. 15 (1904) 71; Corner, Gard. Bull. S.S. 11 (1941) 230.
I. humilis K. & G. var. *scortechinii* Ridl., Fl. 2 (1923) 95.

Endemic, fairly common in lowland forest, with only one record from limestone. (Gua Panjang, Kelantan, *Henderson 19518).*

Ixora umbellata Koord. et Valet., Bijdr. Booms. Java 8 (1902) 162; Corner, Gard. Bull. S.S. 11 (1941) 232.
var. *multibracteata* Corner, l.c. 234.
I. multibracteata K. & G. Mats. 15 (1904) 74.

Knoxia corymbosa Willd., Sp. Pl., 1 (1798) 582; King, Mats.; 15 (1904) 57; Ridl., Fl. 2 (1923) 177; Henders., J. Mal. Br. R. As. Soc. 17 (1939) 49.

Lasianthus stipularis Bl., Bijdr. (1826) 997; Ridl., Fl. 2 (1923) 152; Craib, Fl. Siam 2 (1934) 218; Henders., J. Mal. Br. R. As. Soc. 17 (1939) 50.
var. *hirtus* Ridl., Fl. 2 (1923) 153.

Morinda elliptica Ridl., J. Str. Br. R. As. Soc. 79 (1918) 86, Fl. 2 (1923) 118; Corner, Ways. Trees 1 (1952) 550.

Morinda umbellata L., Sp. Pl. 1 (1753) 176 Ridl., Fl. 2 (1923) 119; Craib, Fl. Siam 2 (1934) 180; Henders., J. Mal. Br. R. As. Soc. 17 (1939) 50, Mal. Wild Fls. Dicots (1959) 219.

Woody climber. Leaves glabrous, elliptic, elliptic-oblong or elliptic-lanceolate, chartaceous or thinly coriaceous, 7-12 by 2-4 cm; sometimes larger. Flowers several to many, densely crowded in terminal heads, 5-12 together, each on a peduncle 1.2-3.5 cm long. Calyx truncate or minutely denticulate; corolla white, throat villous, 0.2 cm long. Fruit a bumpy syncarp, ripening orange, 0.8-2 cm across.

Distributed all over tropical Asia, to S. China, S. Japan and Taiwan, and South-East to Australia. What appears to be a variant of this species has been recorded from limestone in Kedah, Kelantan, Pahang, Perak and Selangor, being common on Bukit Takun and Gua Musang.

This plant is smaller, 1-2 (-3) m long. Leaves elliptic, elliptic-obovate or elliptic-lanceolate, smaller, 4-9 by 1.1-3 (-4) cm. The upper surface varies from glabrous to sparsely or densely hispidulous, the lower surface more or less hispidulous. Flower heads fewer, 1-3 (-5) and ech bears only 3-8 flowers; peduncle short, 0.3-1 cm. The floral structure, however, appears the same. Syncarps smaller, 0.8-1.2 cm across.

Found usually in fairly exposed, dry places; climbing on shrubs or over rocks.

Mycetia malayana Craib, Kew Bull. (1914) 29, Fl. Siam, 2 (1932) 80; Henders., J. Mal. Br. R. As. Soc. 17 (1939) 50, Mal. Wild Fls. Dicots. (1959) 214.
Adenosacme malayana Wall ex Ridl., Fl. 2 (1923) 63.

Nauclea junghuhnii Merr., J. Wash. Acad. Sc. 5 (1915) 536; Craib, Fl. Siam 2 (1932) 6; Henders., J. Mal. Br. R. As. Soc. 17 (1939) 50; Corner, Ways. Trees 1 (1952) 551.
Sarcocephalus junghuhnii Miq., in Ridl., Fl 2 (1923) 7.

Neonauclea calycina Merr., J. Wash. Acad. Sc. 5 (1915) 539; Craib, Fl. Siam 2 (1932) 14.
N. purpurascens Ridl., Fl. 5 (1925) 314.
Nauclea purpurascens Korth. in Ridl., Fl. 2 (1923) 9.

Common in Malaya along rocky streams. Recorded from limestone at and around Gua Musang, Kelantan, by stream banks.

Oldenlandia ovatifolia (Cav.) DC., Prodr., 4 (1830) 427; Craib, Fl. Siam 2 (1932) 57; Henders., J. Mal. Br. R. As. Soc. 17 (1939) 50.
O. nudicaulis Roth., in Ridl., Fl. 2 (1923) 53.

Rare in Malaya, only from the extreme North-west, including Langkawi.

According to Henderson, also from limestone there. I have not seen any specimens of this species which is very similar to *O. rosettifolia.*

Oldenlandia pterita (Bl.) Miq., Fl. Ind. Bat. 2 (1857) 193; Craib, Fl. Siam 2 (1932) 57; Henders., J. Mal. Br. R. As. Soc. 17 (1939) 50.
O. alata Roxb. (non Koen.), in Ridl., Fl. 2 (1923) 53.

Oldenlandia rosettifolia Geddes, Kew Bull. (1928) 242; Craib, Fl. Siam 2 (1932) 58; Henders., J. Mal. Br. R. As. Soc. 17 (1939) 60.

Small herb. Stem 2.5-5 cm or more long. Leaves, in one or more pseudowhorls of 2 pairs of opposite leaves arising very close together, elliptic or oblong, thin, 1-4 by 0.6-1.5 cm, sometimes larger. Inflorescence terminal, slender and lax, 5-7 cm or more long. Flowers small, white; corolla-tube 0.05 cm long, lobes 4, 0.2 cm long. Stamens 4, anthers just over 0.1 cm long. Fruits 2-loculate, 0.25 cm long and slightly broader, top truncate.

Distributed in Thailand, from limestone but not restricted to it. In Malaya, only from Langkawi and so far known, confined to limestone.

Ophiorrhiza communis Ridl., J. Str. Br. R. As. Soc. 61 (1912) 16, Fl. 2 (1923) 39; Craib, Fl. Siam 2 (1932) 63; Henders., Mal. Wild Fls. Dicots. (1959) 208.

Ophiorrhiza discolor R. Br. ex Don, Gen. Syst. 3 (1834) 522; Ridl., Fl. 2 (1923) 36; Craib, Fl. Siam 2 (1932) 64; Henders., J. Mal. Br. R. As. Soc. 17 (1939) 50, Mal. Wild Fls. Dicots. (1959) 209.

A plant of rocky places, not common in Malaya, except on the Selangor limestone. The stem and leaves turn a characteristic pink when dried.

Ophiorrhiza fruticosa Ridl., Fl. 2 (1923) 41; Henders., J. Mal. Br. R. As. Soc. 17 (1939) 50.
O. fruticulosa Ridl., J. Str. Br. R. As. Soc. 61 (1912) 15; non Nadeaud.

Herb. Leaves lanceolate-acuminate, finely pubescent above, 3.5-6.5 by 2-3.5 cm. Peduncle pubescent, 1.2 cm long; terminal. Flowers 0.3 cm long. Capsule laterally oblong, subreniform.

Endemic to limestone in Selangor, rare. Known only from 3 records, Bukit Takun, *(Nur 34374);* Gua Batu *(Ng FRI 1639, Ridley 8237).*

Ophiorrhiza hispidula Wall. ex Don., Gen. Syst. 3 (1834) 523; Ridl., Fl. 2 (1923) 40; Craib, Fl. Siam 2 (1932) 64; Henders., J. Mal. Br. R. As. Soc. 17 (1939) 50.

Ophiorrhiza kunstleri King, Mats. 14 (1904) 176; Ridl., Fl. 2 (1923) 41; Craib, Fl. Siam 2 (1932) 66; Henders., J. Mal. Br. R. As. Soc. 17 (1939) 50.

Herb, unbranched, 15-30 cm tall, shortly pubescent all over. Leaves membranous, elliptic or ovate-elliptic; lateral veins slender, 12-20 pairs; 7-12 by 3-6 cm. Stipules lanceolate, 0.5-0.8 cm long. Inflorescence terminal, 3-6 cm long; peduncle 2-4 cm long. Capsule obreniform, 0.5 cm across.

Distributed in Phuket, Peninsular Thailand. Restricted to limestone in Malaya, and recorded from Kelantan, Langkawi and Perlis; not rare.

Ophiorrhiza longerepens Ridl., Kew Bull. (1929) 258; Henders., J. Mal. Br. R. As. Soc. 17 (1939) 50.

Herb, prostrate and ascending; stem slender, 10-25 cm long, puberulous. Leaves subcoriaceous, ovate, ovate-elliptic to elliptic, glabrescent on the nerves, 1.5-3 by 0.8-1.5 cm. Inflorescence terminal or axillary, peduncle 1-2 cm long. Corolla tube 0.5 cm long, white. Capsule 0.2 cm long and 0.5-0.7 cm wide.

Endemic, known only from limestone around Gua Musang, where it is common. A slender herb often seen creeping over mossy rocks in shade.

Ophiorrhiza pallidula Ridl., Fl. 2 (1923) 38; Henders., J. Mal. Br. R. As. Soc. 17 (1939) 50.

Endemic, not common, in lowland forest, sometimes on limestone.

Ophiorrhiza remotiflora Ridl., J.F.M.S. Mus. 10 (1920) 140; Fl. 2 (1923) 37; Craib, Fl. Siam 2 (1932) 68.
O. major Ridl., Fl. 2 (1923) 36.

Paederia tomentosa B1., Bijdr. (1826) 968; King, Mats. 15 (1904) 97; Ridl., Fl. 2 (1923) 174; Henders., J. Mal. Br. R. As. Soc. 17 (1939) 50.

Pavetta indica Linn., Sp. P1. (1753) 110; Hk.f., F.B.I. 3 (1880) 150; Ridl., Fl. 2 (1923) 100; Henders., J. Mal. Br. R. As. Soc. 17 (1939) 50.

Pavetta naucleiflora R. Br. ex G. Don Gen. Syst. 3 (1834) 575; Ridl., Fl. 2 (1923) 101; *p.p.* Craib, Fl. Siam 2 (1934) 168.

Pavetta pauciflora Ridl., Fl. 2 (1923) 101; Henders., J. Mal. Br. R. As. Soc. 17 (1939) 50.

Small tree. Leaves thin, elliptic-lanceolate, long acuminate, base long, narrowed, 10-15 by 1.2-3.8 cm. Petioles 1.2 cm long. Inflorescence terminal, very lax, to 7 cm long. Calyx-tube subglobose, with 4 short lobes. Corolla tube white, 1.2 cm long, lobes 4, oblong. Stamens 8. Fruit globose.

Endemic and known only from Ridley's collections from Gua Batu, Selangor *Ridley* s.n. 13th Dec. 1920, Dec. 1920 and Dec. 1927).

Petunga hirta Ridl., J. Mal. Br. R. As. Soc. 1 (1923) 69; Henders., J. Mal. Br. R. As. Soc. 17 (1939) 51.

Prismatomeris malayana Ridl., J.F.M.S. Mus. 10 (1920) 142, Fl. 2 (1923) 116; Craib, Fl. Siam 2 (1934) 183; Henders., J. Mal. Br. R. As. Soc. 17 (1939) 51.
P. albidiflora K. et G. Mats. 15 (1904) 90.

Psychotria angulata Korth., Ned. Kruidk. Arch. 2 (1851) 243; Ridl., Fl. 2 (1923) 138; Craib, Fl. Siam 2 (1934) 189; Henders., J. Mal. Br. R. As. Soc. 17 (1939) 51.
P. griffithii Hk. f. var. *angustifolia* Ridl., l.c. 137.

Psychotria cantleyi Ridl., J. Str. Br. R. As. Soc. 61 (1912) 24, Fl. 2 (1923) 130; Henders., J. Mal. Br. R. As. Soc. 17 (1939) 51.

Endemic, not common; recorded from limestone on Gua Batu, Selangor and doubtfully from Kota Glanggi, Pahang.

Psychotria montana Bl., Bijdr. (1826) 960; Ridl., Fl. 2 (1923) 137; Craib, Fl. Siam 2 (1934) 198; Henders., J. Mal. Br. R. As. Soc. 17 (1939) 51.

Psychotria rhinocerotis Reinw. ex Bl., Bijdr. (1826) 961; Ridl., Fl. 2 (1923) 135; Craib, Fl. Siam 2 (1934) 198; Henders., J. Mal. Br. R. As. Soc. 17 (1939) 51.

Psychotria rostrata Bl., Bijdr. (1826) 961; Ridl., Fl. 2 (1923) 134; Craib, Fl. Siam 2 (1934) 197; Henders., J. Mal. Br. R. As. Soc. 17 (1939) 51.

Psychotria sarmentosa Bl., Bijdr. (1826) 964; Ridl., Fl. 2 (1923) 131; Craib, Fl. Siam 2 (1934) 198.

Psychotria viridiflora Reinw. ex Bl., Bijdr. (1826); Ridl., Fl. (1923) 139; Henders., J. Mal. Br. R. As. Soc. 17 (1939) 51; Back. & Bakh. f., Fl. Java 2 (1965) 332.

Randia densiflora (Wall.) Benth., Fl. Hongk. (1861) 155; (including var. *parvifolia),* King, Mats. 14 (1904) 208; Ridl., Fl. 2 (1923) 75; Corner, Gard. Bull. S.S. 10 (1938) 50.
R. cochinchinensis (Lour.) Merrill, Trans. Am. Phil. Soc. 24 (1935) 365; Back. & Bakh. f., Fl. Java 2 (1965) 312.
R. oppositifolia Koords., in Henders., J. Mal. Br. R. As. Soc. 17 (1939) 51.

Distributed all over tropical Asia, from India to China and Japan, to Micronesia and to Australia. A variable species, common in Malaya in lowland forest and on limestone.

Merrill proposed the name *R. cochinchinensis* (Lour.) Merr. for the species on the grounds that it was *Aidia cochinchinensis* Lour. (Comm. Lour. F1. Cochinch. (1935) 365). This is adopted by Backer and Bakhuizen f. l.c. 312. Corner, however, l.c. 50 has given sufficient reasons to effectively dismiss this name.

King l.c. 209 created a var. *parvifolia* giving the distinguishing characters as "leaves narrowly oblong-elliptic, 3-5 in. long and 1.25 to 2.75 in. broad; petioles 0.15 to 0.2 in., Ridley in his Flora, l.c. 76, added on to this writing, "Calyx very pubescent. Corolla lobes white, silky outside".

This variety however is not as easily spotted as defined; there are specimens with narrowly oblong-elliptic leaves, but these only form the end of a range from the ones with broader leaves; there are also such specimens with non pubescent calyx and corolla-lobes. The degree of pubescence varies but independently of the leaf shape; in fact flower size is also variable; and not even the colour is constant. On the label of *Kiah 35275* it is stated that the flowers are pale yellow (instead of the usual cream or white). Based on King and Ridley's concept of a variety *parvifolia*, it has not been possible to identify consistently a variety as such. Therefore, I have ignored such a variety; certainly this variable species needs detailed study.

Tarenna angustifolia (King) Merr., Philip. J. Sc. 17 (1921) 472; Craib, Fl. Siam 2 (1932) 88.
Stylocoryna angustifolia King, Mats. 14 (1904) 199; Ridl., Fl. 2 (1923) 109.

Shrub to 2 m. Leaves coriaceous, narrow, oblong-lanceolate, glabrous, 6-9 by 1.8-2.4 cm. Inflorescence terminal, to 2 cm across. Flowers 0.8 cm long, greenish-white, calyx campanulate, lobes linear lanceolate; corolla short, not exceeding the calyx; anthers 5, connate.

Distributed in Peninsular Thailand. In Malaya, known only from limestone in Perak.

Tarenna appressa (King) Corner, Gard. Bull. S.S. 10 (1938) 51.
Stylocoryne appressa King, Mats., 14 (1904) 200.
Tarenna papillosa Ridl., Fl. 2 (1923) 103.

Endemic and common in lowland forest; once from limestone. (Dayang Bunting, Langkawi, *Stone 6932*).

Tarenna calcarea Ridl., Fl. 2 (1923) 108; Henders., J. Mal. Br. R. As. Soc. 17 (1939) 51.

Shrub. Branches white. Leaves membranous, ovate-cuspidate, 10-12.5 by 5-7.5 cm. Inflorescence terminal, lax and few-flowered, about 4 cm long. Calyx very small with 5 short acute points; corolla-tube 0.3 cm long, lobes, oblong, blunt, nearly as long; anthers as long as the lobes.

Endemic and known only from limestone in Perak. Very rare.

Tarenna curtisii (King) Ridl., Fl. 2 (1923) 107; *p.p.;* Craib, Fl. Siam 2 (1932) 90; Henders., J. Mal. Br. R. As. Soc. 17 (1939) 51.
Webera curtisii King, Mats. 15 (1904) 67. *p.p.*

Shrub, 1-3 m tall. Leaves coriaceous or subcoriaceous, elliptic, elliptic-lanceolate or elliptic-obovate, drying dark olivaceous-brown or purplish-black, glabrous, (2.5-) 5-9 by (1-) 1.5-3.5 cm. Inflorescence terminal, to 2 cm long, buds and branches densely subhirsute. Calyx with ovate-acuminate lobes each about 0.3 cm long. Corolla-tube about as long as the calyx; lobes to 0.9 cm long, white. Fruit globose or subglobose, crowned by the persistent calyx, 0.6-0.8 cm across, 2-loculate with 1-3 seeds in each locule.

Distributed in peninsular Thailand. A common shrub on Malayan limestone. Craib believes that in the original description of this species, collections representing two distinct species were included; *Curtis 2545* is probably a small-leaved form of *T. adangensis* Ridl.

Ridley, l.c. 107, mentioned a variety of this species characterized by very small leaves and more compact habit, found on Gua Batu, Selangor. Later, Henderson l.c. 51, added that this variety has also been found on Gua Tipus, Pahang and suggested that this may be a distinct species. However, after seeing numerous plants of this species growing in various niches on the limestone and examining all the herbarium material available to me, I feel that there is a range of leaf sizes and habit of growth. I therefore propose that the variety suggested by both Ridley and Henderson does not exist.

Generally plants growing on dry rocky exposed summits with hardly and accumulation of soil or humus tend to be stunted and compact and thus produce smaller leaves. Those from hill slopes with fairly deep soil (where there will invariably be a cover of shrubs and small trees) grow under partial shade and exhibit a less restrained manner of growth and will produce larger leaves.

Restricted to limestone.

Tarenna pulchra Ridl., Fl. 2 (1923) 104.
Webera pulchra Ridl., J.F.M.S. Mus. 4 (1909) 33.

Endemic, usually by streams in hill forest, uncommon. Recorded from limestone in Kelantan.

Tarenna ridleyi (Pears.) Ridl., Fl. 2 (1923) 106; Henders., J. Mal. Br. R. As. Soc. 17 (1939) 52.
Webera ridleyi Pears., in King, Mats. 15 (1904) 66.

Endemic, recorded from Singapore, Johore, Pahang and Perak (Gunong Runto, *Henderson 23827).*

Timonius atropurpureus Craib, Fl. Siam 2 (1932) 132; Henders., J. Mal. Br. R. As. Soc. 17 (1939) 52.
T. hirsutus Ridl. Fl. 2 (1923) 115.

Shrub, 2-3 m tall, twigs slender, purple-brown, young parts pubescent. Leaves thin, upper surface glabrescent; lower, more or less sparsely pubescent all over, the hairs denser and longer (to 0.2 cm) on the veins, 3-8 (-10) by 1-2.5 (-3) cm. Stipules ovate-acuminate, 0.3-0.7 cm long. Inflorescence cymose, peduncles 1.5-2.5 cm long, auxillary, male, few flowered; female, solitary. Calyx tube short, lobes to 0.2 cm long, linear. Corolla-tube to 0.6 cm long, lobes 4, small. Fruit oblong, 0.7-1 cm long, bluntly angled; glabrescent.

Distributed in southern Thailand. In Malaya, except for a solitary record from Perak, confined to Langkawi and probably restricted to limestone; not uncommon.

Urophyllum corymbosum Korth., Ned. Kruidk. Arch. 2 (1851) 194; Ridl., Fl. 2 (1923) 67.
U. macrophyllum (Bl.) Korth., in Back. & Bakh. f. Fl. Java 2 (1965) 306.

Urophyllum glabrum Wall., in Roxb., Fl. Ind. 2 (1824) 186; Ridl., Fl. 2 (1923) 68; Henders., Mal. Wild Fls. Dicots (1959) 215.

RUTACEAE

1. Climbers with recurved spines 2
Shrubs or trees, never climbing 3

2. Leaves simple .... *Paramignya scandens*
   Leaves trifoliolate .... *Luvunga eleutherandra*

3. Leaves, all simple 4
   Leaves with 3 or more leaflets; sometimes some leaves simple 7

4. Ovary with 3-5 locules; fruit small: 1-2 cm across 5
   Ovary with 8-15 locules; fruit large: usually more than 5 cm across 6

5. Leaves retuse. Calyx with 2 irregular lobes. Coastal .... *Atalantia monophylla*
   Leaves not retuse, tip acute or blunt. Calyx with 4 lobes. Inland .... *Atalantia roxburghiana*

6. Petioles broadly winged, 2-5 cm wide, distinctly articulated with the blade. Fruit surface smooth .... *Citrus macroptera*
   Petioles not or only narrowly winged, not distinctly articulated with the blade. Fruit surface usually uneven and bumpy .... *Citrus medical*

7. Buds and inflorescence stalk with rust-coloured pubescence. Ovary with 2-5 locules, each with one ovule 8
   Buds and inflorescence stalk not with rust-coloured pubescence. Locules of ovary with 2 or more ovules each 12

8. Ovary rusty pubescent 9
   Ovary not rusty pubescent, usually glabrous 10

9. Leaflets 1 or 3 .... *Glycosmis puberula*
   Leaflets 5-7 .... *Glycosmis sapindoides*

10. Leaves elliptic-lanceolate, apices acute, often acuminate 11
    Leaves broadly elliptic to orbicular, apices rounded, usually notched .... *Glycosmic calcicola*

11. Leaflets 3, secondary nerves 4-5 pairs .... *Glycosmis rupestris*
    Leaflets 4-7, secondary nerves 5-8 pairs .... *Glycosmic chlorosperma*

12. Petals 4, stamens 8 13
    Petals 5,, stamens 10 14

12. Leaflets 6-7. Very rare, doubtfully recorded once from Malaya .... *Clausena harmandiana*
    Leaflets 9-30. Common. .... *Clausena excavata*

14. Flowers numerous, in clusters; crushed leaves faintly to strongly spicy or pungent 15
    Flowers solitary or few together; crushed leaves very faintly smelling of lime *Murraya paniculata*

15. Leaflets 3-11, large: 3-17 by 2-5 cm .... *Micromelum minutum*
    Leaflets 9-23, small: 2-5 by 0.6-2.5 cm .... *Murraya koenigii*

Atalantia monophylla D.C., Prodr. 1 (1824) 535; Swingle, Citrus Ind. 1 (1967) 316; Stone, Tree Fl. Mal. 1 (1972) 373.

A. spinosa (Willd.) Tan., in Henders., J. Mal. Br. R. As. Soc. 17 (1939) 39; Corner, Ways. Trees 1 (1952) 567.

Atalantia roxburghiana Hk.f., F.B.I. 1 (1875) 515; Swingle, Citrus Ind. 1 (1967) 322; Stone, Tree Fl. Mal. 1 (1972) 373.

A. kwangtungensis Merr. sensu Henders., J. Mal. Br. R. As. Soc. 17 (1939) 39, and possibly also sensu Merr.

Possibly endemic, in open country and on limestone.

Citrus macroptera Montr., Mem. Acad. Sci. Lyon 10 (1860) 187; Swingle, Citrus Ind. 1 (1967) 395; Stone, Tree Fl. Mal. 1 (1972) 374.

Clausena excavata Burm. f., Fl. Ind. (1768) 87; Ridl., Fl. 1 (1922) 352; Swingle, Citrus Ind. 1 (1967) 212; Stone, Tree Fl. Mal. 1 (1972) 375.

Glycosmis calcicola Stone, Gard. Bull S. 26 (1972) 55, Tree Fl. Mal. 1 (1972) 381. *G. parkinsonii* Tan. var. *ovatofoliolis* Tan., in Henders., J. Mal. Br. R. As. Soc. 17 (1939) 39.

Shrub, 1-3 m tall. Leaflets (1-) 3-5 (-7), broadly elliptic, ovate to orbicular, 2-6 by 1.4-3.5 cm. Young twigs, petioles and petiolules usually finely pubescent. Flowers few, in short axillary racemens. Fruits ripen red to dark blue/purple, oviod, to nearly 1 cm long.

Endemic to limestone and widely distributed, common, often on dry craggy summits.

var. **kelantanica** Stone l.c. 57.

This has larger leaves. So far only recorded from limestone in Kelantan.

Glycosmis chlorosperma (B1.) Spreng., Syst. Veg. 4 (1827) 162; Henders., J. Mal. Br. R. As. Soc. 17 (1939) 39; Stone, Tree F1. Mal. 1 (1972) 382.
G. malayana Ridl., Fl. 1 (1922) 350.

Glycosmis puberula Lindl., in Wall. Cat. (1832) 6375; Ridl., Fl. 1 (1922) 351; Stone, Tree Fl. Mal. 1 (1972) 381.

Glycosmis rupestris Ridl., J. Str. Br. R. As. Soc. 59 (1911) 81; Fl. 1 (1922) 350; Henders., J. Mal. Br. R. As. Soc. 17 (1939) 39.

Glycosmis sapindoides Lindl. ex Wall., Cat. (1832) 6376; Hk. f., F.B.I. 1 (1875) 501; Ridl., Fl. 1 (1922) 351; Henders., J. Mal. Br. R. As. Soc. 17 (1939) 39; Stone, Tree Fl. Mal. 1 (1972) 381.

Endemic, uncommon; once recorded from limestone.

Luvunga eleutherandra Dalz., in Hooker, J. Bot. Kew Gard. Misc. 2 (1850) 258; Ridl., Fl. 1 (1922) 355; Swingle, Citrus Ind. 1 (1967) 267; Stone, Tree Fl. Mal. 1 (1972) 369.

Micromelium minutum (Forst.) Wt. & Arn., Prodr. F1. Pen. Ind. Or. 1 (1834) 94; Swingle, Citrus Ind. 1 (1967) 203; Stone, Tree Fl. Mal. 1 (1972) 383.
M. pubescens B1., in Ridl., Fl. 1 (1922) 352; Henders., J. Mal. Br. R. As. Soc. 17 (1939) 39.

Murraya koenigii (L.) Spr., Syst. Veg. 2 (1825) 315; Swingle, Citrus Ind. 1 (1967) 237; Stone, Tree Fl. Mal. 1 (1972) 385.

Recorded once from limestone, doubtfully wild (Batu Ayam, Langkawi, *Henderson 28947).*

Murraya paniculata (L.) Jack, Malay Misc. 1 (1820) 31; Henders., J. Mal. Br. R. As. Soc. 17 (1939) 39; Swingle, Citrus Ind. 1 (1967) 231; Stone, M.N.J. 24 (1971) 93, Tree Fl. Mal. 1 (1967) 384.
M. exotica L., in Ridl., Fl. 1 (1922) 353.

Shrub or small tree, 2-5 m tall. Leaves with 3-7 leaflets. Leaflets elliptic or elliptic-ovate, tapered at both ends. Flowers solitary or few in axillary or terminal cymes. Fruit an ovoid berry.

Distributed in India, China and southwards to Australia. In Malaya, it is common on the limestone hills of Perak and Kelantan; rightly stated as 'wild on limestone hills ...' by Ridley l.c. Its presence on the limestone has been doubted, with reason, by Henderson l.c., as strangely no specimens from limestone were collected prior to 1961. This species is also widely cultivated.

Paramignya scandens (Griff.) Craib subsp. *ridleyi* (Burkill) Swingle, J. Wash. Acad. Sci. 28 (1930) 533, Citrus Ind. 1 (1967) 273; Stone, Tree Fl. Mal. 1 (1972) 384.
P. griffithii Ridl., Fl. 1 (1922) 356.

Endemic and rare; known only from Singapore and Malacca. Recently from limestone on Gua Batu, Selangor (Stone 8981).

Dubious records

Citrus medica L., Sp. Pl. (1753) 782; Ridl., Fl. 1: 1922) 358; Swingle, Citrus Ind. 1 (1967) 370; Stone, Tree Fl. Mal. 1 (1972) 375.

Doubtfully wild in Malaya. One specimen was collected from near limestone; doubtfully on limestone and probably cultivated (Batu Pinta, Bertam, Kelantan, *UNESCO 1017*).

Clausena harmandiana (Pierre) Guill., Not. Syst. 1 (1910) 219; Swingle, Citrus Ind. 1 (1967) 222.

A small tree, distributed in Cambodia and Laos. Doubtfully recorded from Malaya. The specimen, *Henderson 23820* in Singapore identified as such probably has the wrong locality or may have the wrong label attached.

SANTALACEAE

Scleropyrum wallichianum Arn., Jard. Mag. Zool. & Bot. 2 (1858) 550.
Scleropyrum sp., Henders., J. Mal. Br. R. As. Soc. 17 (1939) 68.

Tree, spiny. Leaves elliptic-ovate or oblong, coriaceous, 8-15 by 3-7 cm; 3-nerved at the base. Racemes 2-5 cm long, spicate; perianth 0.2-0.3 cm across. Fruit, pyriform, 2.5 cm long, crowned by the persistent perianth.

Distributed in India and in Ceylon, usually in the highlands to 2000 m. Recorded from limestone in Kedah at a low altitude. This is apparently the only record of the species outside India and Ceylon; this locality is about 2400 km to the East of Ceylon but at roughly the same latitude.

SAPINDACEAE

1. Leaves trifoliolate or odd-pinnate 2
   Leaves even-pinnate 4

2. Leaves trifoliolate 3
   Leaves odd-pinnate .... *Paranephelium macrophyllum*

3. Leaves subcoriaceous, glabrous .... *Allophylus cobbe* var. *glaber*
   Leaves thin, pubescent .... *Allophylus cobbe* var. *villosus*

4. Inflorescence large, terminal, 8-40 cm long .... *Dimocarpus longan* ssp. *longan* var. *longan*
   Inflorescence small, axillary, 2.5-5 cm long .... *Xerospermum wallichii*

Allophylus cobbe (L.) Raeusch., Nomencl. ed. 3 (1797) 108; Corner, Gard. Bull. S.S. (1938) 40; Leenh; Blumea 15 (1967) 322.

A very variable species which, when taken in a broad sense, is distributed over most of the tropics and subtropics.

var. glaber Corner, l.c. 40.

Leaves subcoriaceous glabrous.

Widely distributed in lowland forest in Malaya, sometimes on limestone.

var. *villosus* Corner, l.c. 42.

Leaves thin, more or less hispid-velvety. Widely distributed in lowland forest in Malaya, recorded on limestone from Kedah and Perlis. Apart from having thinner pubescent leaves this is identical to var. *glaber;* degree of pubescence varies and transitions to var. *glaber* appear commonly.

Dimocarpus longan Lour., Fl. Coch. (1790) 233; Leenh., Blumea 19 (1971) 122.
Nephelium echinulatum Ridl., Fl. 1 (1922) 503.
N. malaiense Griff., in Corner, Ways. Trees 1 (1952) 592.
N. setosum Ridl., Fl. 1 (1922) 503.

ssp. **longan** Leenh., l.c. 126.

var. **longan** Leenh. l.c. 126. As *Nephelium ?mutabile* Bl., in Henders., J. Mal. Br. R. As. Soc. 17 (1939) 42.

Tree. Leaves even-pinnate, leaflets (2-) 4-5 pairs; chartaceous to coriaceous, glabrous above, subglabrous below, elliptic, ovate-eliptic or ovate-lanceolate, 3-19 by 1.5-6.5 cm. Inflorescence terminal, 8-40 cm long; flowers yellowish brown, petals reduced, shorter than the calyx. Fruits subglobular, 1.2-1.5 cm across, usually warty.

Distributed in Ceylon, India, Burma, Thailand, China, Taiwan and southwards to Borneo, Java. Philippines, and New Guinea. Widely cultivated; it is difficult to draw the limits of the area of natural distribution. Recorded from limestone on Gunong Pondok; the only record of this subspecies from Malaya *(Henderson 23812).*

Paranephelium macrophyullum King, Mats. 8 (1896), 450; Ridl., Fl. 1 (1922) 509; Corner, Ways. Trees 1 (1952) 594.

Xerospermum wallichii King, Mats. 8 (1896) 432; Ridl., Fl. 1 (1922) 498; Henders., J. Mal. Br. R. As. Soc. 17 (1939) 42.

Endemic, not common in lowland and hill forest. According to Henderson l.c., recorded from limestone at the base of Gunong Baling, Kedah.

SAPOTACEAE

1. Leaves glabrous when mature 2
   Leaves velvety or densely woolly when mature 8

2. Leaves glaucous below; more than 15 cm long, obovate ..... *Palaquium obovatum*
   Leaves not glaucous below 3

3. Leaves densely clustered; twigs very stout, 0.8-2.0 cm across ..... *Madhuca ridleyi*
   Leaves spaced or loosely clustered; twigs not as stout 4

4. Base of leaves tapered; young leaves and twigs and leaves scurfy ..... *Planchonella obovata*
   Base of leaves cuneate or rounded 5

5. Base of leaves rounded, margin upcurled, wavy ..... *Mimusops elengi*
   Base of leaves cuneate, margin different 6

6. Apex of leaves acuminate, blade thinly coriaceous to coriaceous 7
   Apex rounded ..... *Isonandra perakensis* var. *kelantanensis*

7. Twigs scurfy when young; leaves oblong. Flowers not crowded in pseudoterminal heads ..... *Payena lucida*
   Twigs glabrous; leaves elliptic to obovate. Flowers crowded in pseudoterminal heads. Only Dayang Bunting, Langkawi ..... *Madhuca calcicola*

8. Leaves densely woolly below ..... *Palaquim ottolanderi*
   Leaves velvety below 9

9. Leaves coriaceous, margin recurved, base rounded or slightly acuminate. All leaves velvety below ..... *Isonandra perakensis* var. *perakensis*
   Leaves thinly coriaceous, margin not recurved, base acuminate. Some older leaves glabrous below ..... *Planchonella obovata*

Isonandra perakensis K. & G., J.As. Soc. Beng 74 (1906) 166; Ridl., Fl. 2 (1923) 261; Henders., J . Mal. Br. R. As. Soc. 17 (1939) 54; Jeuken, Blumea 6 (1952) 577; Ng, Tree Fl. Mal. 1 (1972) 400.

var. **kelantanensis** Ng., Gard. Bull. S. 24 (1969) 7, Tree Fl. Mal. 1 (1972) 400.

Small tree, 5-10 m tall. Leaves spiral, loosely clustered, broadly elliptic-ovate or broadly elliptic, 3.5-6 by 2.5-4 cm. Flowers 1-2 in axils of leaves, sepals 5, corolla 4-lobed. Fruits and seeds unknown.

Endemic. Known only from Gua Jaya and Gua Panjang, Kelantan and Gua Peningat, Pahang. According to Ng l.c., possibly a new species, but more material is needed.

var. **perakensis,** Ng, Tree Fl. Mal. 1 (1972) 400.

Small tree, 5-10 m tall. Leaves spiral, loosely clustered, 4-13 by 2-6 cm, elliptic, occasionally elliptic-obovate, lower surface velvety. Flowers in the axils of upper leaves, to 16.

Recorded only from the limestone in Perak, endemic.

Madhuca calcicola van Royen, Blumea 10 (1960) 96; Ng, Tree F1. Mal. 1 (1972) 405.

Small tree. Leaves loosely clustered, 5-18 by 2-7 cm, elliptic to obovate, glabrous. Apex acute to acuminate, base acute. Flowers axillary, sepals 4, corolla 10 lobes; stamens 20; ovary glabrous. Fruits unknown.

Endemic and known only from the limestone at Pulau Dayang Bunting, Langkawi.

Madhuca ridleyi Lam, Gard. Bull. S.S. 9 (1935) 105; Henders., J. Mal. Br. R. As. Soc. 17 (1939) 54; Ng, Tree Fl. Mal. 1 (1972) 409.

Small tree, 20-30 m. Twigs stout, 0.8-2 cm across. Leaves very closely clustered at the ends of twigs, 12-25 by 4-11 cm, obovate. Flowers in clusters in leaf axils. Fruits round, to 3 cm across.

Endemic and apparently restricted to limestone except in Perlis where according to Ng l.c., "the species may also be found on low and even seasonally swampy land". On limestone, this species is usually found on day craggy summits, it is uncommon but widely distributed.

Mimusops elengi L., Sp. Pl. (1753) 349; Ridl., Fl. 2 (1923) 278; Henders., J. Mal. Br. R. As. Soc. 17 (1939) 54; Ng, Tree Fl. Mal. 1 (1972) 414.

In Malaya, cultivated throughout, wild in Perlis, Langkawi, and northern Kedah, on rocky coastal areas and inland forest; not uncommon on limestone in Langkawi.

Palaquium obovatum (Griff.) Engl., Bot. Jahrb. 12 (1890) 511; Ridl., Fl. 2 (1923) 273; Ng. Tree Fl. Mal. 1 (1972) 423.

Palaquium ottolanderi K. et V., Bijdr. Booms. Java 1 (1894) 146; Ng, Tree Fl. Mal. 1 (1972) 424.
P. clarkeanum K. et G. in Rid., Fl. 2 (1923) 274.

Payena lucida (G. Don) DC., Prodr. 8 (1884) 197; Ng, Tree Fl. Mal. 1 (1972) 433.
P. dasyphylla var. *glabrata* K. et G., J. As. Soc. Beng. 74 (1905) 174; Ridl., Fl. 2 (1923) 265.

Planchonella obovata (R. Br.) Pierre, Not. Bot. Sapot. (1890) 36; Ng, Tree Fl. Mal. 1 (1972) 437.
Sideroxylon ferrugineum Hk. et Arn. *in* Ridl., Fl. 2 (1923) 259.

In Malaya, common on rocky and sandy sea coasts throughout and on summits of limestone hills.

SCROPHULARIACEAE

1. Leaves linear, narrowly elliptic or lanceolate 2
   Leaves ovate to broadly ovate 3

2. Corolla tube very short; stamens 4, more or less equal, surrounded by numerous hairs from the corolla .... *Scoparia dulcis*
   Corolla tube long; stamens 4, didynamous, not surrounded by hairs .... *Centranthera hispida*

3. Pubescent herb; flowers in dense spherical or ovoid heads .... *Adenosma capitatum*
   Glabrous herb; flowers in lax racemes .... *Curanga amara*

Adenosma capitatum Benth. ex Hance, J. Linn. Soc. 13 (1873) 114; Hk. f., F.B.I. 4 (1885) 264; Ridl., Fl. 2 (1923) 474; Henders., J. Mal. Br. R. As. Soc. 17 (1939) 59; Mal. Wild Fls. Dicots. (1959) 330.

Centranthera hispida R. Br., Prodr. (1810) 438; Hk.f., F.B.I. 4 (1885) 301; Henders., J. Mal. Br. R. As. Soc. 17 (1939) 60.

Recorded from Malaya only once, in Langkawi, by Selat Panchor, on limestone *(Henderson 29057).*

Curanga amara Juss., Ann. Mus. Par. 9 (1807) 320; Hk. f., F.B.I. 4 (1885) 275; Ridl., Fl. 2 (1923) 484; Henders., J. Mal. Br. R. As. Soc. 17 (1939) 60.

Fairly common by rivers and forests in shady places. Recorded once from limestone (Ampang, Perak, *Burkill 13925).*

Scoparia dulcis L., Sp. (1753) 116; Hk.f., F.B.I. 4 (1885) 289; Ridl., Fl. 2 (1923) 488; Henders., Mal. Wild Fls. Dicots. (1959) 328.

A common weed of open places with one record from limestone in Langkawi, at "sea level, exposed to sea spray" *(Turnau 743).*

SOLANACEAE

1. Leaves simple, entire or sometimes lobed 2
   Leaves compound; fruit a succulent berry, 1-2 cm across, ripening orange-red .... *Lycopersicon esculentum* var. *carasiforme*

2. Leaves without spines, glabrous or pubescent 3
   Leaves spiny especially along the veins, densely stellate tomentose .... *Solanum ferox*

3. Fruits enclosed in the bladder-like enlarged sepals .... *Physalis minima*
   Fruits not so enclosed, sepals normal 4

4. Flowers solitary or 2-6 together in axillary fascicles 5
   Flowers in inflorescences with a peduncle 2-7 cm long, usually extra-axillary 7

5. Fruits globose 6
   Fruits conical, 1-2 by 0.3-0.7 cm .... *Capsicum frutescens*

6. Flowers solitary, calyx-lobes 5 .... *Solanum biflorum*
   Flowers solitary or 2-6 together in fascicles, calyx-lobes 10-11 .... *Solanum decemdentatum*

7. Leaves glabrous or glabrescent; flowers in a simple umbellate inflorescence; stem without prickles .... *Solanum nigrum*
   Leaves densely stellate pubescent especially below; flowers in branched corymbose inflorescence; stem prickled, sometimes sparsely .... *Solanum torvaum*

Physalis minima L., Sp. Pl. (1753) 183; Ridl., Fl. 2 (1923) 470; Henders., Mal. Wild Fls. Dicots. (1959) 325.

A pantropical weed, in waste and cultivated grounds; common in Malaya. Once recorded from limestone at the base of a hill in Perak.

Solanum biflorum Lour., Fl. Cochinch. (1790) 129; Hk.f., F.B.I. 4 (1883) 232; Ridl., Fl. 2 (1923) 467.

Lycianthes biflora (Lour.) Bitt., Abh. Nat. Ver. Bremen 24 (1920) 461; Craib, Fl. Siam 3 (1954) 45; Back. & Bakh. f., Fl. Java 2 (1965) 476.

Shrub. Leaves elliptic or oblong, thin, pubescent or glabrescent; entire, base decurrent, 4-12 by 2-4.5 cm. Flowers axillary, solitary; pedicels 0.6 cm long. Calyx-lobes 0.2 cm long; corolla-lobes lanceolate, slightly longer than the calyx. Fruit globose, glabrous, 0.5-0.8 cm across.

Distributed in S. China and Indochina. Rare in Malaya, known only from limestone or localities close to it; in Kelantan, Pahang and Selangor.

Solanum decemdentatum Roxb., Fl. Ind. 1 (1820) 565; Ridl., Fl. 2 (1923) 466; Henders., J. Mal. Br. R. As. Soc. 17 (1939) 59.

Uncommon in Malaya, usually in rocky places in the North. According to Henderson l.c. recorded from limestone on Gunong Senyum, Pahang.

Solanum ferox L., Sp. Pl. (ed. 2) 2 (1763) 267; Hk.f., F.B.I. 4 (1883) 233; Ridl., Fl. 2 (1923) 467; Burk., Dict. Econ. Prod. Mal. (2nd impr.) 2 (1966) 2079.

Distributed in Ceylon, India, throughout SE. Asia and Malesia. Fairly common in Malaya in waste-ground; said to have been brought into Malaya from Java (Ridley l.c.). Sometimes cultivated, as the fruits are used as a sour-relish (chiefly by the Indians) and various parts of the plant are used in Malay medicine (Burkill, l.c.). Recorded *(Stone 9497)* from the summit of Gua Musang (1970), as a secondary element found 12 months after fire destroyed the original vegetation. According to the collector, the species was also seen at the base of the hill in railwaymen's living quarters. He also suggested that this was the probable source of the plant on the summit. This must be the case as the species is very likely endo-ornithochorous (eaten and dispersed by birds after seeds have passed through their digestive tracts).

Solanum nigrum L., Sp. Pl. (1753) 186; Ridl., Fl. 2 (1923) 465; Craib, Fl. Siam 2 (1954) 40; Henders., Mal. Wild Fls. Dicots. (1959) 323.

Distributed throughout the tropical and temperate regions. Common in waste ground in Malaya, once collected from limestone (Perak, *Burkill 13939*)

Solanum torvum Sw., Prodr. (1788) 47; Ridl., Fl. 2 (1923) 468; Craib, Fl. Siam 2 (1954) 43; Henders., Mal. Wild Fls. Dicots. (1959) 324.

Pantropical. Common in Malaya, in waste ground and villages, often cultivated for its edible fruits. Recorded from limestone on the slopes of Gunong Pondok *(Chin 867)*, most probably as an escape from nearby villages.

Note

Lycopersicon esculentum Mill., (the tomato), probably the var. *cerasiforme* (Dun.) Alef. (Cherry Tomato, with fruits 1-2 cm in diameter) and *Capsicum frutescens* Linn. (Bird Chilli, with erect, conical fruits 1-3 cm long) have been recorded as escapes from cultivation on hill bases. Both these plants are frequently cultivated and are taken by birds which probably spread them in their droppings.

STAPHYLEACEAE

Turpinia ovalifolia Elmer, Leafl. Philip. Bot. 2 (1908) 490; Lind., Fl. Mal. I, 6 (1960) 58.
T. trifoliata Ridl., Fl. 1 (1922) 511.

Rare in Malaya in lowland forest. Once from limestone on Gua Panjang, Kelantan *(UNESCO 683)*.

STERCULIACEAE

1. Leaves ovate-cordate or broadly ovate, palmately veined at the base 2
Leaves elliptic, oblong, obovate or lanceolate, pinnately veined; basal pair of veins sometimes to ⅓ or ½ the blade 4

2. Leaf margin entire; sometimes lobed 3
Leaf margin serrated .... *Melochia umbellata*

3. Petiole not or only weakly kneed at both ends; flowers tubular, bright orange, scurfy; fruit wall thin, coriaceous .... *Firmiana malayana*
Petiole kneed at both ends; flowers small, greenish; fruits of woody pods .... *Ptergota alata*

4. Basal pair of nerves reaching ⅓ to ½ the length of leaves; a shrub 5
Not so; nearly always a tree 6

5. Leaves equal-sided .... *Helicteres angustifolia*
Leaves unequal-sided .... *Helicteres hirsuta*

6. Lower surface of leaves glabrous or sparsely pubescent 7
Lower surface of leaves densely covered by adpressed stellate scales or erect stellate hairs 8

7. Flowers in short axillary cymes, cymes less than 0.5 cm long .... *Leptonychia glabra*
Flowers in panicles 2-4 cm long, produced after fall of leaves. Only from Langkawi .... *Sterculia lancaviensis*

8. Pubescence of adpressed stellate scales and/or hairs 9
Pubescence of erect stellate hairs 12

9. Coastal tree, ... 10
Inland forest trees 11

10. Leaves 5.5-10 cm long, chartaceous; fruits with five very prominent ridges .... *Pterospermum pectiniforme*
Leaves (7-)10-25 cm long, coriaceous; fruits with a keel on one side .... *Heritiera littoralis*

11. Leaves with distinctly cordate or subcordate base, lower surface with adpressed scales .... *Heritiera pterospermoides*
Leaves with obtuse or rounded base, lower surface with adpressed stellate hairs .... *Pterospermum jackianum*

12. Calyx 5-cleft to the middle .... *Sterculia angustifolia*
Calyx 5-cleft almost to the base .... *Sterculia rubiginosa*

Firmiana malayana Kosterm., Reinw. 5 (1961) 384; Kochumm., Tree Fl. Mal. 2 (1973) 357.
F. colorata Roxb., in Kosterm., Reinw. 4 (1957) 285.
F. fulgens (Wall. ex King) Corner, Ways. Trees 1 (1922) 610.
Erythropsis fulgens (Wall. ex Mast.) Ridl., Fl. 1 (1922) 277.

Fairly common in Malaya in the northern half, in lowland forest, sometimes cultivated. A sterile specimen from Bukit Chintamani, Pahang, *(Chin 557)* is doubtfully this. However, I have seen this species in flower on the lower slopes of Bukit Takun, Selangor.

Helicteres angustifolia L., Sp. Pl. (1753) 963; Ridl., Fl. 1 (1922) 282; Back. & Bakh. f., Fl. Java 1 (1963) 410.
H. lanceolata DC., in Henders., J. Mal. Br. R. As. Soc. 17 (1939) 37.

Helicteres hirsuta Lour., Fl. Cochinch. (1970) 530; Ridl., Fl. 1 (1922) 281; Corner, Ways. Trees 1 (1952) 611.

Heritiera littoralis Aiton, Hort. Kew Inst. ed. 3 (1789) 546; Ridl., Fl. 1 (1922) 279; Kosterm., Reinw. 4 (1959) 473; Kochumm., Tree Fl. Mal. 2 (1973) 361.

Common on sandy and rocky shores and in mangrove swamps; the fruits are dispersed by water. Recorded from coastal limestone in Langkawi.

Heritiera pterospermoides Kosterm., Reinw. 4 (1959) 506; Kochumm., Tree Fl. Mal. 2 (1973) 363.

Tree to 20 m. Twigs, lower surface of leaves and inflorescence covered with adpressed scales. Stipules lanceolate to 1 cm long, caducous. Leaves elliptic-oblong to oblong-obovate, base subcordate, firm chartaceous to subcoriaceous, 8-20 by 3-9 cm; petioles 0.5-1 cm. Panicles axillary to 6 cm long; perianth urceolate, to 0.5 cm long, 4-5 lobed. Fruits unknown.

Distributed in Sumatra (known from one collection). In Malaya, restricted to limestone; there are several known records. Recent explorations have shown that this is not a rare tree on the Perak limestone. It is usually found in places with fair accumulation of soil; young trees have larger leaves and the petiole may reach 2 cm in length.

Leptonychia glabra Turcz., Bull. Soc. Nat. Mosc. 31 (1858) 222; Ridl., Fl. 1 (1922) 289; Kochumm., Tree Fl. Mal. 2 (1973) 365.

Melochia umbellata (Houtt.) Stapf, Kew Bull. (1913) 317; Back. & Bakh. f., Fl. Java 1 (1963) 405; Kochumm., Tree Fl. Mal. 2 (1973) 366.
M. velutina Wall. ex Bedd., in Ridl., Fl. 1 (1922) 285.

Pterospermum jackianum Wall. ex Masters, in Hk.f., F.B.I. 1 (1874) 367; Ridl., Fl. 1 (1922) 283; Kochumm., Tree Fl. Mal. 2 (1973) 369.

Pterospermum pectiniforme Kosterm., Reinw. 6 (1962) 296.

Distributed in Thailand. Known in Malaya only from Langkawi. Recorded from coastal limestone on Pulau Timun, Langkawi, *(Stone 9134 & 10993).*

Pterygota alata (Roxb.) R. Br., in Benn., Pl. Jav. Rar. 2 (1844) 234; Kosterm., Reinw. 2 (1953) 365; Kochumm., Tree Fl. Mal. 2 (1973) 371.
Sterculia alata Roxb., Hort. Beng. (1814)50; Corner, Ways. Trees 1 (1952) 619.

Sterculia angustifolia Roxb., Hort. Beng. (1814) 50; Ridl., Fl. 1 (1922) 274; Henders., J. Mal. Br. R As. Soc. 17 (1939) 37; Kochumm., Tree Fl. Mal. 2 (1973) 378.

Tree 10-13 m. Twigs, lower surface of leaves, and inflorescence rusty tomentose. Leaves membranous, oblong to obovate-lanceolate, base rounded, apex acute or acuminate, 10-17 by 3-6 cm. Panicles terminal and subterminal, lax, 5-15 cm long. Fruit ovate-oblong, about 7 by 3 cm, beak short.

Distributed in Burma, very rare in Malaya, known from a single collection from Gunong Pondok, Perak.

Sterculia lancaviensis Ridl., J. R. As. Soc. Str. Br. 54 (1911) 29, Fl. 1 (1922) 270; Henders., J. Mal. Br. R. As Soc. 17 (1939) 37.

Small deciduous tree. Leaves obovate, glabrous, about 9 by 4 cm; petioles 0.6-1.2 cm long. Panicles lax, much branched, 2-4 cm long, produced after fall of leaves. Flowers with campanulate perianth, male with 6 stamens. Fruits red with elliptic black seeds.

Distributed in southern Thailand and also from North Malaya. A species little known, probably restricted to limestone.

Sterculia rubiginosa Vent., Jard. Malm. 2 (1805) t. 91; Ridl., Fl. 1 (1922) 271; Henders., J. Mal. Br. R. As. Soc. 17 (1939) 37.

(N.B. For note on Theaceae see p. 173)

THYMELAEACEAE

1. Leaves ovate or elliptic, apex acute to acuminate 2
Leaves obovate, oblanceolate or elliptic-oblong, seldom elliptic, apex rounded or obtuse, rarely acute .... *Wikstroemia indica*

2. Inflorescence racemose; rachis usually elongating, 0.5-4 cm long. Rare *Wikstroemia polyantha*
Inflorescence umbelliform; rachis not elongating, very short, always less than 0.5 cm long. Not uncommon on craggy summits .... *Wikstroemia androsaemifolia*

Wikstroemia androsaemifolia Decne, Ann. Sc. Nat. Bot. II, 20 (1843) 50; Hou, Fl. Mal. I, 6 (1960) 33; Back. & Bakh. f. Fl. Java 1 (1963) 269; Whitmore, Tree Fl. Mal. 2 (1973) 384.

Shrub 1-3.5 m. Young parts of twigs, buds and petioles finely pubescent. Leaves glabrous, rarely glabrescent, 2.5 by 1-2(-3) cm, base and apex acute; thin to subcoriaceous. Veins distinct below, obscured above. Inflorescence terminal or subterminal, umbelliform, 3-6(-10) flowered. Ovary ellipsoid or slightly obovoid, glabrescent or pubescent at the top. Fruits obovoid or oblong, 0.4-0.6 cm across, ripen red.

Distributed in Java, Borneo, Celebes and Western New Guinea; only recently recorded for Malaya (Whitmore l.c.). This is a forest plant, extending from coastal areas to over 2000 m. In Malaya it has been found to be restricted to limestone in Selangor, Kelantan and Pahang. Not rare and always on dry craggy summits. It is common on Bukit Takun, Selangor.

Wikstroemia indica (L.) C.A. Mey., Bull. Ac. Sc. St. Petersb. 1 (1843) 357; Hou, Fl. Mal. I, 6 (1960) 34; Back. & Bakh. f. Fl. Java 1 (1963) 296.
W. viridiflora Meisn., in Ridl., Fl. 3 (1924) 145; Henders., J. Mal. Br. R. As. Soc. 17 (1939) 68.

Shrub 1-3 m tall. Leaves chartaceous to subcoriaceous, obovate, oblanceolate or sometimes elliptic, 1.5-4(-6) by 0.5-2 (-3) cm, base cuneate, apex rounded or obtuse, rarely acute. Flowers 0.8-1.2 cm long, greenish-yellow. Fruits broadly ellipsoid about 0.6 by 0.4 cm, ripening red.

Distributed in India, SE. Asia, Malesia and to Australia and Melanesia. In Malaya, frequently on limestone though not exclusive so, from the lowlands to the hills, up to 900 m. Common on limestone in the North.

Wikstroemia polyantha Merr., Philip. J. Sc. 10 (1915) Bot. 332; Ridl., Fl. 3 (1924) 145; Hou, Fl. Mal. I, 6 (1960) 32; Back. & Bakh. f., Fl. Java 1 (1963) 269.

Usually collected from the hills and mountains from 600 to 2050 m. Only once recorded from limestone at the low elevation of about 180 m. Gua Serai, Kelantan *(UNESCO 338)*.

TILIACEAE

1. Climbing or scrambling shrub .... *Grewia acuminata*
   Shrubs or trees 2
2. Leaves oblong, lanceolate or ovate; lower surface densely or sparsely pubescent; base cuneate, obtuse or rounded, rarely cordate; petiole to 1.5 cm long 3
   Leaves ovate, broadly ovate to suborbicular; lower surface glabrous; base cordate; petiole 1.5-7 cm .... *Berrya cordifolia*
3. Petioles kneed; fruit a winged capsule 4
   Petioles not kneed; fruit not winged, a drupe or berry 5
4. Leaf-bases almost symmetrical; rounded or cuneate .... *Colona merguensis*
   Leaf-bases very asymmetrical; cordate .... *Colona javanica*
5. Leaves glabrous on the upper surface; fruit drupaceous, with a stone 6
   Leaves sticky hairy all cover; fruit a fleshy berry, with numerous tiny seeds *Muntingia calabura*
6. Leaves abruptly acute; elliptic-oblong, oblong to oblong-obovate .... *Grewia tomentosa*
   Leaves long acuminate; lanceolate to elliptic-lanceolate .... *Grewia viminea*

Berrya cordifolia (Willd.) Burret, Notizbl. Berl.-Dahlem 9 (1926) 606; Kochumm., Tree Fl. Mal. 2 (1973) 393.
B. ammonilla Roxb., in Ridl., Fl. 1 (1922) 299; Henders., J. Mal. Br. As. Soc. 17 (1939) 38.

Tree to 10 m. Leaves alternate, ovate, broadly ovate to suborbicular; apex long and acuminate, base cordate; 5-7 nerved, glabrous, 6-17 by 3-15 cm. Inflorescence a panicle, axillary and terminal, about 20 cm long. Calyx 3-5 lobed, petals 5, stamens many. Capsule winged.

Distributed in India, Ceylon, Andamans, Nicobars and W. Malaysia. Rare in Malaya, known only from Langkawi, Kedah; not known whether only on limestone.'

Colona javanica (Bl.) Burret, Notizbl. Berl.-Dahlem 9 (1926) 733; B10. Back. & Bakh. f., Fl. Java 1 (1963) 394; Kochumm., Tree Fl. Mal. 2 (1973) 395.
Columbia integrifolia Ridl., Fl. 1 (1922) 306; Henders., J. Mal. Br. As. Soc. 17 (1939) 38.

Tree to 10 m. Leaves oblong or obovate-oblong. Shortly acuminate, very unequal-sided, cordate; lower surface pubescent, 4-30 by 1.5-8.5 cm. Inforescence terminal and axillary, to 17 cm long. Flowers with sepals 5 petals, stamens numerous. Fruits with 3 wings about 3 cm across the wings.

Distributed in Sumatra and Java. Very rare in Malaya, known only from a single collection, (Lenggong, Perak, *Ridley 14702)* on limestone.

Colona merquensis (Planch. ex Mast.) Burret, Notizbl. Berl.-Dahlem 9 (1926) 807; Kochumm., Tree Fl. Mal. 2 (1973) 395.
Columbia curtisii Ridl., Fl. 1 (1922) 307; Henders., J. Mal. Br. R. As. Soc. 1939.
C. diptera Ridl., Fl. l.c. 307.

Tree to 12 m. Leaves lanceolate, ovate-lanceolate to ovate, base rounded to broad-cuneate, 3-nerved, apex long pointed; lower surface sparsely tomentose, 6-18 by 2.5-5 cm. Inflorescence a lax terminal panicle, sparingly branched, to 15 cm. Flowers bracteate, sepals 5, petals 5, stamens numerous. Fruit 3- winged, including the wings about 3 cm across.

Distributed in lower Burma and Thailand. Restricted to Perlis and Langkawi, and nearly always confined to limestone; not uncommon.

Grewia acuminata Juss., Ann. Mus. Par. 4 (1804) 91; Back. & Bakh. f., Fl. Java 1 (1963) 393; Kochumm., Tree Fl. Mal. 2 (1973) 397.
G. umbellata Roxb., Fl. 1 (1922) 300.

Grewia paniculata Roxb. ex DC., Hort. Beng. (.1814) 93; Ridl., Fl. 1 (1922) 300; Kochumm., Tree Fl. Mal. 2 (1973) 397.
G. tomentosa Juss., in Corner, Ways. Trees 1 (1952) 643.

Grewia viminea Wall. ex Burret, Notizbl. Berl.-Dahlem 9 (1926) 713; Kochumm., Tree Fl. Mal. 2 (1973) 397.
G. polygama Roxb. var. *curtisii* Ridl., Fl. 5 (1925) 294; Henders., J. Mal. Br. R. As. Soc. 17 (1939) 38.

Shrub. Leaves lanceolate-acuminate, base 3-nerved, lower surface pubescent, margin serrate, 7-10 by 1.8-2.5 cm. Inflorescence axillary, to 5 cm long. Fruit drupaceous, about 1.2 cm across.

Distributed in Burma and Thailand. In Malaya, only from Kedah and Perlis, restricted to limestone.

Muntingia calabura L., Sp. Pl. (1753) 509; Corner, Ways. Trees 1 (1952) 644; Stone, Fl. Guam (1970) 404.

Native of Tropical America, now over most of the Tropics. Common in Malaya, in cultivation or as escapes. Recorded from limestone of disturbed localities.

ULMACEAE

1. Leaves alternate, pubescent, scabrid on the upper surface; margin serrated. From secondary forest 2
   Leaves spiral, glabrous; margin entire. From primary forest .... *Celtis philippensis*
2. Leaf-base symmetrical; lower surface of leaf with stellate and simple hairs ...... *Trema orientalis*
   Leaf-base mostly asymmetrical; lower surface of leaf with only simple hairs .... *Trema tomentosa*

Celtis philippensis Blanco, Fl. Filip (1837) 197; Soepadmo, Tree Fl. Mal. 2 (1973) 415; Fl. Mal. I, 8 (1977) 62.
C. collinsae Craib, in Ridl., Fl. 3 (1924) 322; Henders., J. Mal. R. As. Soc. 17 (1939) 72.
C. wightii Planch., Ann. Sc. Nat. 10 (1848) 307.

Shrub or small tree, 2-6(-10) m tall. Leaves elliptic, elliptic-oblong, oblong-lanceolate to ovate-lanceolate, glabrous, coriaceous; base distinctly 3-nerved; main nerves raised on the lower surface; petiole 0.5-1.2 cm; blade (3.5-)5-9(-12) by (1.3-)2-4(-6) cm. Inflorescence racemose, 0.5-1 cm long, with male flowers on the lower and hermaphrodite flowers on the upper parts. Fruits ovoid-globose, one seeded, about 1.2 cm long.

Distributed from tropical Africa across to Indochina and Hainan; throughout Malesia and to Australia and Solomon Islands. In Malaya, recorded from Perlis, Kedah, SW. Kelantan and NW. Pahang; restricted to limestone. Soepadmo l.c., records flowering in November-December and fruiting in March-May. Fruits have also been collected in August and November. It is quite common on the Langkawi limestone.

Trema orientalis (L.) Bl., Mus. Bot. Lugd. Bat. 2 (1856) 62; Hk.f., F.B.I. 5 (1885) 484; Corner, Ways. Trees 1 (1952) 694; Soepadmo, Tree Fl. Mal. 2 (1973) 421; Fl. Mal. I, 8 (1977) 51.
Celtis orientalis L., Sp. Pl. (1753) 1044.

Trema tomentosa (Roxb.) Hara, Bull. Univ. Mus. Univ. Tokyo 2 (1971) 19; Soepadmo, Tree Fl. Mal. 2 (1973) 423; Fl. Mal. I, 8 (1977) 53.
T. amboinensis Bl., in Ridl., Fl. 3 (1924) 319.

A common species throughout Malaya, which like *T. orientalis* has been recorded on disturbed areas on limestone as a component of secondary vegetation. This species is distinguished from *T. orientalis* by its leaf bases being mostly asymmetrical-cordate, by the hairs which are always simple, and by the more slender inflorescence.

URTICACEAE

1. Herbs, to 2m tall 2
   Shrubs or trees, much taller 7

2. Leaves very small, 0.2-0.6 cm long .... *Pilea microphylla*
   Leaves much larger 3

3. Basal pair of nerves elongate, to ½ or more of the lamina 4
   Basal pair of nerves not elongate. A succulent herb .... *Procris pedunculata*

4. Leaves inequilateral at the base; low herbs to 30 cm tall 5
   Leaves equilateral at the base; herbs (15-)30-100(-200) cm tall 6

5. Male cymes peduncled, branched .... *Elatostema latifolium*
   Male cymes sessile, capitulate .... *Elatostema curtisii*

6. Leaves small, 2-8 cm long, usually broadest near the middle, 3-nerved .... *Pilea fruticosa*
   Leaves larger, 7-15 cm long, broadest near the base, 3-nerved at the base but with 2-5 other pairs .... *Laportea interrupta*

7. Basal pair of nerves to at least ½ the blade 8
   Basal pair of nerves not elongate 9

8. Twigs with soft prickles .... *Debregeasia squamata*
   Twigs without prickles .... *Boehmeria nivea*

9. Leaves, lower surface glabrous; sometimes slightly mealy on the veins below, scrambling shrub .... *Poikilospermum suaveolens*
   Leaves, lower surface, pubescent; especially on the veins, erect trees 10

10. Inflorescence 5-50 cm long; plant with stinging hairs 11
    Inflorescence 1-2 cm long; plant without stinging hairs .... *Villebrunea sylvatica*

11. Flowers sessile .... *Dendrocnide stimulans*
    Flowers pedicellate .... *Dendrocnide sinuata*

Boehmeria nivea Hk. & Arn., Bot. Beech. Vey. 5 (1837) 214; Hk. f., F.B.I. 5 (1888) 576; Henders., J. Mal. Br. R. As. Soc. 17 (1939) 72; Back. & Bakh. f., Fl. Java 2 (1965) 45.

Distributed in India, China, Japan and SE. Asia, widely cultivated. Recorded from limestone on Gunong Keriang, Kedah, perhaps as an escape from cultivation.

Debregeasia squamata King ex Hk.f., F.B.I. 5 (1888) 591; Ridl. Fl. 3 (1924) 368; Henders., J. Mal. Br. R. As. Soc. 17 (1939) 73.

Shrub about 5 m tall, branches rough, tomentose and covered with soft prickles. Leaves ovate or orbicular, cuspidate, margin toothed, pubescent on both sides, 3-nerved from the base, 10-15 by 7-10 cm. Flower-heads in short-branched cymes about 1.2 cm long. Flowers orange, fruit red.

Endemic to Malaya, not common, usually on limestone.

Dendrocnide sinuata (Bl.) Chew, Gard. Bull. S. 21 (1965) 206; ibid. 25 (1969) 36. *Laportea pustulosa* Ridl., J. Str. Br. R. As. Soc. 82 (1920) 194, Fl. 3 (1924) 360; Molesworth-Allen, Gard. Bull. S. 20 (1964) 361.

Small tree, 3-11 m tall, with stinging hairs. Dioecious. Leaves elliptic, oblong or rhombic, rarely ovate or obovate, upper surface glabrescent 18-40(60) by 7-20(-35) cm; petioles 6-20 cm long. Inflorescence unisexual: male 5-15 cm long; female 10-30 cm long; perianth 4-lobed. Achenes 0.3-0.5 cm long, pyriform, pustular.

Distributed in India, Ceylon, China, Burma, Vietnam, Thailand, Sumatra and Java. Known only from Perak in Malaya; until recent collections (all from limestone) by Molesworth-Allen, known only from Scortechinii's collection from upper Perak (not recorded whether from limestone).

Dendrocnide stimulans (L.f.) Chew, Gard. Bull. S. 21 (1965) 206, ibid, 25 (1969) 11.
Laportea stimulans (L.f.) Miq., Zoll. Syst. Verz. (1854) 103; Ridl., Fl. 3 (1924) 360; Molesworth-Allen, Gard. Bull. S. 20 (1964) 361.

Elatostema curtisii (Ridl.) Schrot., Rep. Beih. 83 (1935) 18; Henders., J. Mal. Br. R. As. Soc. 17 (1939) 73.
Pellionia curtisii Ridl., J. Str. Br. R. As. Soc. 82 (1920) 196; Fl. 3 (1924) 362.

Endemic and rare. Recorded once from limestone. (from Rotan Segar, Tambun, Perak, *Molesworth-Allen 4652).*

Elatostema latifolium (Bl.) H. Schrot., Rep. Beih. 83 (1935) 17; Henders., J. Mal. Br. R. As. Soc. 17 (1939) 73; Back. & Bakh. f., Fl. Java 2 (1965) 42.
Pellionia javanica (Wedd.) Wedd., in Ridl., Fl. 2 (1924) 362.

Laportea interrupta (L.) Chew, Gard. Bull. S. 21 (1965) 200, ibid. 25 (1969) 145.
Fleurya interrupta Gaud., in Ridl., Fl. 3 (1924) 359; Henders., J. Mal. Br. R. As. Soc. 17 (1939) 74.

Pilea fruticosa Hk.f., F.B.I. 5 (1888) 558; Ridl., Fl. 3 (1924) 360; Henders., J. Mal. Br. R. As. Soc. 17 (1939) 74.
P. calcarea Ridl., J. Str. Br. R. As. Soc. 82 (1920) 196, Fl. 3 (1924) 361; Henders., J. Mal. Br. R. As. Soc. 17 (1939) 74.

Herb, 15-100 cm tall. Leaves elliptic, elliptic-ovate or elliptic-lanceolate, margin serrate or crenate, sometimes osbcurely so, base 3-nerved, glabrous, 2-8 (-10) by 1.2-4(-5) cm. Inflorescence axillary, 0.5-5 cm long, peduncle short or to 5 cm long. Flowers in small clusters; males: petals 2-4, stamens 2-4; females: petals 3, rarely 4. Achenes ovoid, about 0.1 cm long.

Endemic to limestone in Malaya, common except in the extreme Northwest. A herb of shady rocky places.

Pilea microphylla (L.) Lieb., Vidensk. Selsk. Skr. 5 (1951) 302; Henders., Mal. Wild Fls. Dicot. (1959) 466; Stone, Micronesica 6 (1970) 257.
Pilea muscosa Lindl., in Ridl., Fl. 3 (1924) 361.

Poikilospermum suaveolens (Bl.) Merr. Centr. Arn. Arb. 8 (1934) 47; Chew, Gard. Bull. S. (1963) 88.
Conocephalus amoenus King apud Hk.f., F.B.I. 5 (1888) 545; Ridl., Fl. 3 (1924) 357.
C. suaveolens Bl., in Ridl., l.c. 357.

Procris pedunculata (J.R. & G. Forst.) Wedd., in DC. Prod. 16 (1869) 191; Back. & Bakh. f., Fl. Java. 2 (1965) 44; Stone, Micronesica 6 (1970) 258.

Succulent herb, erect or sprawling, 30-150 cm tall. Leaves glabrous, elliptic-oblong, oblong-obovate, or oblong-lanceolate, margin undulate-dentate, or entire, 7-20 by 2-7 cm long. Male flowers in branched cymes, 1-7 cm long. Female flowers in dense sessile heads 0.5-1.5 cm across.

Distributed from Malesia to the Pacific Islands. Apparently not common in Malaya except on Bukit Anak Tukun limestone where it is abundant in shady parts.

Villebrunea sylvatica (Miq.) Bl., Mus. Bot. Lugd. Bat. 2 (1856) 167; Ridl., Fl. 3 (1924) 367.
Oreocnide sylvatica Miq., in Henders., J. Mal. Br. R. As. Soc. 17 (1936) 74.

VERBENACEAE

1. Leaves simple, entire or sometimes lobed 2
Leaves with 3 or 3-5 leaflets 13

2. Lower surface of leaves glabrous or more or less pubescent; tomentum not completely covering surface 3
Lower surface of leaves densely tomentose; tomentum usually completely covering surface, a dirty white or tawny colour 7

3. Surface of leaves strigose; flowers in umbels; plant prickly, with pungent odour .... *Lantana camara* var. *aculeata*
Surface of leaves not strigose, flowers in elongate racemes or panicles 4

4. Lower surface of leaves densely glandular; leaves usually lobed 5
Lower surface of leaves not glandular 6

5. Leaves large 10-25 cm long, 3-7 lobed. Inflorescence a large terminal panicle .... *Clerodendron paniculatum*
Leaves smaller 3-6 cm long, lobed or not. Inflorescence a terminal raceme 2-5 cm long .... *Gmelina asiatica*

6. Base of leaves gradually narrowed; leaves usually obovate-lanceolate; margin somewhat serrate .... *Clerodendron serratum*
Base of leaves not so. Leaves elliptic, elliptic-ovate or elliptic-oblong; margin entire .... *Clerodendron pendulifolium*

7. Tomentum stellate (lens!) 8
Tomentum not stellate 10

8. Inflorescence axillary, small or 7-10 cm long with peduncle 9
Inflorescence terminal, about 30 cm long .... *Premna pyramidata*

9. Leaves narrow: less than 3 cm wide. Inflorescence 8-16 flowered. Common on limestone, often on craggy summits. Sub-shrub or shrub .... *Callicarpa angustifolia*
Leaves broad: 5-13 cm wide. Inflorescence with numerous flowers. Rare on limestone. Tree .... *Callicarpa arborea*

10. Bracts 3-4, leafy and showy, subtending the capitate cyme .... *Congea vestita*
Bracts if present, different 11

11. Petioles 1-5 cm long 12
Petioles 0.2-0.3 cm long .... *Glossocarya mollis*

12. Corolla large, 3-4 cm long, upper half dilated, campanulate .... *Gmelina villosa*
    Corolla much smaller .... *Gmelina rubens*

13. Very rare on limestone, never on dry craggy summits .... *Vitex pubescens*
    Common and restricted to limestone, usually on dry craggy summits .... *Vitex siamica*

Callicarpa angustifolia K. & G., Kew Bull (1908) 106; Ridl., Fl. 2 (1923) 616; Henders., J. Mal. Br. As. Soc. 17 (1939) 64.

Subshrub or shrub, 1-2-3 m tall, slender and tawny tomentose. Leaves opposite, subcoriaceous, 8-15 by 1.8-3 cm, elliptic-lanceolate; upper surface becoming glabrous with age, lower surface with a dense mat of fine stellate scales. Cymes axillary, 2 times dichotomously branched, about 1 cm long, 8-16 flowered. Drupe globose, ripens black.

Endemic to Malayan limestone; usually on dry craggy summits, preferring exposed situations but tolerating part shade. Widely distributed.

Callicarpa lanata L., Mant. 2 (1767) 331; Hk.f., F.B.I. 4 (1885) 567; Lam, Verb. Mal. Arch., Thesis, Utrecht (1919) 79.
C. arborea Roxb., in Ridl., Fl. 2 (1923) 614; Henders., J. Mal. Br. R. As. Soc. 17 (1939) 65.

Clerodendron paniculatum L., Mant. 1 (1767) 90; Lam, Verb. Mal. Arch., Thesis, Utrecht (1919) 295; Ridl., Fl. 2 (1923) 628; Henders., J. Mal. Br. R. As. Soc. 17 (1939) 65.

Frequently cultivated. Not uncommon in waste ground and forest fringes; recorded from limestone on the summit of Gunong Baling; not known whether wild or an escape from cultivation.

Clerodendron penduliflorum Wall., Cat. (1828) 1795; Hk.f., F.B.I. 4 (1885) 591; Lam. Verb. Mal. Arch., Thesis, Utrecht (1919) 265; Ridl., Fl. 2 (1923) 626; Henders., J. Mal. Br. R. As. Soc. 17 (1939) 65.

Clerodendron serratum Spr., Syst. 2 (1825) 578; Hk.f., F.B.I. 4 (1885) 592; Lam. Verb. Mal. Arch., Thesis, Utrecht (1919) 267; Ridl., Fl. 2 (1923) 626; Henders., J. Mal. Br. R. As. Soc. 17 (1939) 65.

Congea vestita Griff., Notul. Pl. As. 4 (1854) 174; Lam, Verb. Mal. Arch., Thesis, Utrecht (1919) 338; Ridl., Fl. 2 (1923) 640; Munir, Gard. Bull. S. 21 (1966) 302.
C. tomentosa Roxb., in Hk.f., F.B.I. 4 (1885) 603.

Glossocarya mollis Wall., Cat. (1829) 1741; Hk.f., F.B.I. 4 (1885) 598; Henders., J. Mal. Br. R. As. Soc. 17 (1939) 65.

Scandent shrub. Twigs, lower surface of leaves and inflorescence grey-villose. Leaves opposite, ovate, ±8 by 4 cm; petioles very short. Corymbs ±7 cm across. Corolla white, 0.8 cm long, filaments exserted.

Distributed in peninsular Thailand. Recorded on limestone by Henderson from Pulau Rabana off Kuala Perlis, otherwise unknown in Malaya.

Gmelina asiatica L., Sp. Pl. (1753) 873; Lam, Verb. Mal. Arch., Thesis, Utrecht (1919) 221; Ridl., Fl. 2 (1923) 662.

Gmelina villosa Roxb., Fl. Ind. 3 (1832) 86; Lam, Verb. Mal. Arch. Thesis. Utrecht (1919) 217; Ridl., Fl. 2 (1923) 623.

Not uncommon, coastal and in secondary vegetation inland. Recorded from limestone at the base of hills on disturbed ground.

Lantana camara L., Sp. Pl. (1753) 627.

var. *aculeata* (L.) Moldenke, Torreya 34 (1934) 9; Stone, Micronesica 6 (1970) 506.
L. aculeata L., Sp, Pl. (1753) 627; Ridl., Fl. 2 (1923) 613.

Premna pyramidata Wall., Cat. (1927) 1779; Lam, Verb. Mal. Arch., Thesis, Utrecht (1919) 155; Ridl., Fl. 2 (1923) 622; Henders., J. Mal. Br. R. As. Soc. 17 (1939) 65.

Premna rubens Ridl., Fl. 2 (1923) 618.
P. flavescens var. *rubens* Cl. in Hk.f., F.B.I. 4 (1885) 578.

This species is probably endemic to Malaya (doubtfully recorded from Java), it is rare and recorded once from limestone.

Vitex pubescens Vahl, Symb. Bot. 3 (1794) 85; Lam, Verb. Mal. Arch., Thesis, Utrecht (1919) 183; Ridl., Fl. 2 (1923) 632; Henders., J. Mal. Br. R. As. Soc. 17 (1939) 65.

Vitex siamica Will., Bull. Herb. Boiss. Ser. 2, 5 (1905) 431; Lam, Verb. Mal. Arch., Thesis, Utrecht (1919) 197; Ridl., Fl. 2 (1923) 632; Henders., J. Mal. Br. R. As. Soc. 17 (1939) 65.

Tree 5-10 m tall. Leaves 3-foliolate; leaflets subcoriaceous, glabrous, entire, ovate or ovate-lanceolate, lateral leaflets sometimes slightly asymmetric, slightly smaller than the terminal one; terminal leaflet 6-9(-12) by 1.8-4 cm. Panicles terminal 10-30 cm long; corolla light blue or white, tube about 0.25 cm long. Drupe globose 0.3-0.4 cm across.

In Malaya, this species is restricted to limestone where it is common except in Perak; also recorded from peninsular Thailand. This plant is usually found on the upper parts of hills and often on dry craggy summits, precariously rooted in cracks and crevices.

VIOLACEAE

1. Capsule pubescent with long soft spines. Leaves pubescent below .... *Rinorea anguifera*
Capsule glabrous, sometimes warty. Leaves glabrous or pubescent along veins only 2

2. Capsule ovoid-acute, apex pointed. Leaves usually with a long acuminate tip 2-4 cm long, pubescent on the nerves below .... *Rinorea horneri*
Capsule globose or ovoid, apex rounded. Leaves without a long drawnout tip, sometimes abruptly acuminate 3

3. Leaves hairy on the veins below. Very rare on limestone .... *Rinorea macrophylla*
   Leaves glabrous. Found on most hills .... *Rinorea bengalensis*

Rinorea anguifera (Lour.) O. Kuntze, Rev. Gen. Pl. 1 (1891) 42; Jacobs, Blumea 15 (1967) 127.
Alsodeia capillata King, in Ridl., Fl. 1 (1922) 133.
A. comosa King, in Ridl., l.c. 133.
A. echinocarpa Korth, in Ridl., l.c. 134.

Rinorea bengalensis (Wall.) O. Kuntze, Rev. Gen. Pl. 1 (1891) 42; Jacobs, Blumea 15 (1967) 120.
R. wallichiana O. Kuntze, Henders., J. Mal. Br. R. As. Soc. 17 (1939) 35.
Alsodeia langkawiensis Ridl., Fl. 1 (1922) 129.
A. wallichiana Hk.f., in Ridl., l.c. 128.

Shrub or small tree, 2-6 m tall. Leaves variable, (4-)8-15(-20) by (1.5-)3-6(-8) cm; chartaceous to coriaceous, glabrous. Fruit, globose to ovoid, bluntly 3-angled, surface finely warty to almost smooth, about 1 cm long.

Widely distributed from India, Ceylon, Burma, through Malesia and to northern Australia. Common and found on a large number of limestone hills in Malaya; also in lowland forest.

Rinorea horneri (Korth.) O. Kuntze, Rev. Gen. Pl. 1 (1891) 42; Jacobs, Blumea 15 (1967) 130.
R. kunstleriana Taub., in Henders. J. Mal. Br. R. As. Soc. 17 (1939) 35.
Alsodeia hirtella Ridl., Fl. 1 (1922) 128.
A. kunstleriana King, in Ridl., l.c. 128.

Widely distributed and fairly common on limestone except in the North. Usually in partly shaded localities with some accumulation of soil.

Rinorea macrophylla (Decne.) O. Kuntze, Rev. Gen. Pl. 1 (1891) 42; Jacobs, Blumea 5 (1967) 135.
R. dasycaula Craib, in Henders., J. Mal. Br. R. As. Soc. 17 (1939) 35.
Alsodeia dasycaula Miq., in Ridl., Fl. 1 (1922) 129.

VITACEAE

1. Climbers, usually with tendrils 2
   Not climbers 17

2. Flowers on a flattened, undulating rachis .... *Pterisanthes coriacea*
   Flowers in a spicate or cymose inflorescence, rachis terete or subterete 3

3. Leaves simple, lobed or not 4
   Leaves 3-5 or more foliolate 11

4. Back of leaves pubescent or densely tomentose 5
   Back of leaves usually glabrous, rarely minutely pubescent 7

5. Leaves trilobed, cordate .... *Vitis martinelli*
   Leaves not lobed, ovate-cordate or oblong-ovate 6

6. Leaves cordate, back densely tomentose, pale brownish or rusty red colour ...... *Cissus pyrrhodasys*
Leaves hardly cordate, back pubescent or tomentose, but of a different colour ...... *Tetrastigma scortechinii*

7. Leaves varigated with red and white ...... *Cissus discolor*
Leaves not so 8

8. Stem winged, 4-angled, glaucous ...... *Cissus hastata*
Stem not winged, at most angular 9

9. Leaves distinctly cordate, petioles 4-5 cm long ...... *Cissus repens*
Leaves with broad bases, shortly cuneate or only slightly cordate; petioles 1-3 cm long 10

10. Leaves ovate-acuminate to lanceolate, somewhat coriaceous. Ripe fruits, black *Cissus rostrata*
Leaves elliptic-cuspidate, herbaceous. Ripe fruits, red ...... *Cissus glaberrima*

11. Petals free, disc not lobed, stigma dilated and 4-lobed 12
Petals connate, falling in a cap, disc 4-lobed, stigma much reduced 15

12. Leaves digitately 3-foliolate 13
Leaves 3-5 foliolate; if 3-foliolate, then ripe fruits white 14

13. Leaves coriaceous, glaucous on the lower surface with prominent reticulations. Corymbs, on wood ...... *Tetrastigma peduncularis*
Leaves not so. Corymbs, not on old wood ...... *Tetrastigma wrayi*

14. Fruit pulpy ...... *Tetrastigma lanceolarium*
Fruit dry ...... *Tetrastigma kunstleri*

15. Leaves 7-9 foliolate ...... *Cissus novemfolia*
Leaves 3 or 3-5 foliolate 16

16. Stem with long hairs, leaves 3 foliolate, hairy ...... *Cayratia mollissima*
Stem glabrous or finely pubescent, leaves 3-5 foliolate, softly pubescent or glabrous on the undersurface ...... *Cayratia japonica*

17. Plant with very short erect stem ...... *Leea saxatilis*
Plant with stem 1-5 m tall 18

18. Branches of inflorescences and the outside of petals red, leaves large, imperfectly 3-pinnate ...... *Leea rubra*
Branches of inflorescences and the outside of petals green, leaves usually imperfectly 2-pinnate 19

19. Lower surface of adult leaves densely covered by scales. Corymbs 5-10 cm wide ... *Leea aequata*
Lower surface of adult leaves not with scales, hairy or not. Corymbs 5-35 cm wide ...... *Leea sambucina*

Cayratia mollissima (Wall.) Gagn., Notul. Syst. 1 (1911) 345.
Vitis mollissima Wall., in Roxb., Fl. Ind. 2 (1832) 482; King, Mats. 8 (1896) 402; Ridl., Fl. 1 (1922) 478; Henders., J. Mal. Br. R. As. Soc. 17 (1939) 42.

Common on the edges of forest. Recorded from limestone in Perlis, Perak and Kelantan, rare.

Cissus discolor Bl., Bijdr. (1825) 181; Back. & Bakh. f. Fl. Java 2 (1965) 91.
Vitis discolor (Bl.) Dalz., in Kew J. 2 (1850) 39; King, Mats. 8 (1896) 399; Ridl., Fl. 1 (1922) 477.

Slender climber, stems red. Leaves simple, ovate-oblong-lanceolate, base cordate or truncate, dark green, variegated with red and white; pink below, 5-10 by 2-5 cm. Fruit pyriform or globose.

Widely distributed from India to Thailand and southwards to Sumatra. In Malaya, chiefly in the North and usually on limestone.

Cissus glaberrima (Wall.) Steud., Nom. Bot. ed. 2. 1 (1840) 372.
Vitis glaberrima Wall., in Roxb., Fl. Ind. 2 (1832) 476; King, Mats. 8 (1896) 401; Ridl., Fl. 1 (1922) 477; Henders., J. Mal. Br. R. As. Soc. 17 (1939) 41.

Cissus hastata Miq., Fl. Ind. Bot. Suppl. 1 (1861) 517; Back. & Bakh. f., Fl. Java 2 (1965) 92.
Vitis hastata (Miq.) Miq., Ann. Mus. Bot. Lugd. Bat. 1 (1863) 85; Ridl., Fl. 1 (1922) 478; Henders., J. Mal. Br. R. As. Soc. 17 (1939) 41.

Cissus novemfolia (Wall.) Planch., in DC., Monog. Phan. 5 (1887) 559.
Vitis novemfolia Wall., Cat. (1832) 6030; Law., in Hk.f., F.B.I. 1 (1875) 662; King, Mats. 8 (1896) 403; Ridl., Fl. 1 (1922) 479; Henders., J. Mal. Br. R. As. Soc. 17 (1939) 42.

Cissus pyrrhodasys Miq., Fl. Ind. Bot. Suppl. 1 (1861) 517.
Vitis pyrrhodasys (Miq.) Ridl., Fl. 1 (1922) 476; Henders., J. Mal. Br. R. As. Soc. 17 (1939) 42.

Cissus repens Lamk., Encycl. 1 (1783) 31; Gagn., Fl. Gen. Indo-China 1 (1912) 970.
Vitis repens (Lamk.) Wight et Arn., Prod. Fl. Ind. Pens. (1834) 125; Ridl., Fl. 1 (1922) 477; Henders., J. Mal. Br. R. As. Soc. 17 (1939) 42.

Cissus rostrata (Miq.) Planch., in DC., Monog. Phan. 5 (1887) 500; Back. & Bakh. f., Fl. Java 2 (1965) 90.
Vitis furcata Laws., in Hk.f., F.B.I. 1 (1875) 646; Ridl., Fl. 1 (1922) 476.

Leea aequata Mant. (1767) 124; King, Mats. 8 (1896) 418; Ridl., Fl. 1 (1922) 486; Henders., J. Mal. Br. R. As. Soc. 17 (1939) 41; Back. & Bakh. f., Fl. Java 2 (1965) 94.

Leea rubra Bl., Bijdr. (1825) 197. King, Mats. 8 (1896) 416; Ridl., Fl. 1 (1922) 485; Henders., J. Mal. Br. R. As. Soc. 17 (1939) 41; Back. & Bakh. f., Fl. Java 2 (1965) 94.

Leea sambucina Willd., Sp. Pl. 1 (1798) 1177; King, Mats. 8 (1896) 414; Ridl., Fl. 1 (1922) 484; Back. Bakh. f., Fl. Java 2 (1965) 94.

Leea saxatilis Ridl., J. Str. Br. R. As. Soc. 75 (1917) 26, Fl. 1 (1922) 486.

Plant with a very short erect stem. Leaves pinnate, petioles to 45 cm long, leaflets usually 10-17 by 5 cm, glabrous, when adult, corymb about 2 cm across. Drupe to 0.8 cm across, red when ripe.

Endemic, uncommon and often on limestone.

Pterisanthes coriacea Korth. ex Miq., Ann. Mus. Bot. Lugd. Bat. 1 (1863) 95; King, Mats. 8 (1896) 407; Ridl., Fl. 1 (1922) 480.

Tetrastigma kunstleri (King) Craib, Fl. Siam Enum. 1 (1926) 313.
Vitis kunstleri King, Mats. 8 (1896)) 396; Ridl., Fl. 1 (1922) 475.

Endemic to Malaya, found in forests and often on limestone.

Tetrastigma lanceolarium (Roxb.) Planch., in DC., Monog. Phan. 5 (1887) 433; Back. & Bakh. f., Fl. Java 2 (1965) 89.
Vitis lanceolaria (Roxb.) Wall., Cat. (1832) 6013; King, Mats. 8 (1896) 395; Ridl., Fl. 1 (1922) 475; Henders., J. Mal. Br. R. As. Soc. 17 (1939) 41.

Tetrastigma peduncularis (Wall.) Planch., in DC., Monog. Phan. 5 (1887) 438.
Vitis peduncularis Wall., Cat. (1832) 6024; Law., in Hk.f., F.B.I. 1 (1875) 655; King, Mats. 8 (1896) 393; Ridl., Fl. 1 (1922) 474.

Tetrastigma scortechini (King) Gagn., in Lec., Notul. Syst. 1 (1911) 376.
Vitis scortechinii King, Mats. 8 (1896) 392; Ridl., Fl. 1 (1922) 474; Henders., J. Mal. Br. R. As. Soc. 17 (1939) 42.

Glabrous climber. Leaves simple, oblong-ovate, subcoriaceous, 12-18 by 6-9 cm. Cymes compact, ±2.5 cm across. Fruits small: ±0.6 cm across, waxy white when ripe.

Endemic and as far as the records go, restricted to limestone. Recorded only from Gunong Pondok, Perak and according to Ridley, from Gua Batu, Selangor as well.

Tetrastigma wrayi (King) Craib, Fl. Siam. Enum. 1 (1926) 314.
Vitis wrayi King, Mats. 8 (1896) 394; Ridl., Fl. 1 (1922) 475.
Endemic and found in forests, not uncommon. Recorded on limestone only from Kedah and Selangor.

Vitis martinelli Kew ex Planch, in DC., Monog. Phan. 5 (1887) 375; Ridl., Fl. 1 (1922) 471.

Dubious record

Cayratia japonica (Thunb.) Gagn., Notul. Syst. 1 (1911) 349; Back. Bakh. f., Fl. Java 2 (1965) 93.
Vitis japonica Thunb., Fl. Jap. (1784) 104; King, Mats. 8 (1896) 403; Ridl., 1 (1922) 478; Henders., J. Mal. Br. R. As. Soc. 17 (1939) 41.

NOTE

THEACEAE (TERNSTROEMIACEAE)

Henderson in J. Mal. Br. R. As. Soc. 17 (1939) 37 records *Saurauia cauliflora* Bal. var. *calycina* King and *Schima noronhae* Reinw. as dubious records from limestone. I have, however, not come across any specimens from limestone and, therefore, am omitting this family. (*Saurauia* is now generally treated as belonging to the family Saurauiaceae).

Angiosperms — Monocotyledons

AGAVACEAE

The following key to *Draceaena,* based on what few specimens I have seen and the scanty literature available, should be regarded as provisional. This genus needs a through revision.

1. Twigs stout, 2-3 cm across .... *Dracaena yuccaefolia*
   Twigs slender, usually less than 1 cm across 2
2. Leaves elliptic to elliptic-lanceolate, 5-8 cm wide .... *Dracaena congesta*
   Leaves linear or lanceolate, 1-3.5 cm wide 3
3. Leaves 50-75 cm long .... *Dracaena curtisii*
   Leaves 15-40 cm long 4
4. Leaves 1.5-3.5 cm wide .... *Dracaena porteri*
   Leaves 0.8-1.3 cm wide 5
5. Flowers in clusters of 3-4 on the inflorescence axis .... *Dracaena graminifolia*
   Flowers in pairs or single on the inflorescence axis 6
6. Flowers 1.5-2.5 cm long .... *Dracaena angustifolia*
   Flowers 3-4 cm long .... *Dracaena nutans*

Dracaena angustifolia Roxb., Hort. Beng. (1814) 24; Hk.f., F.B.I. 6 (1894) 327.
Pleomele angustifolia (Roxb.) N.E. Br., Kew Bull. 8 (1914) 277.

Dracaena congesta Ridl., Trans. Linn. Soc. 3 (1893) 388; Fl. 4 (1924) 334; Henders., J. Mal. Br. R. As. Soc. 17 (1939) 81.
D. pachyphylla Kurz., Hk.f., F.B.I. 6 (1894) 329, *p.p.*

Plant short, stem to 15 cm tall. Leaves elliptic-lanceolate, 20-25 by 5-8 cm. Petioles broad, slightly sheathing at the base. Inflorescence short, many flowered.

Distributed in Borneo; in Malaya often though not always on limestone, in shady places.

Dracaena curtisii Ridl., Jour. R. As. Soc. S. Br. 59 (1911) 210; Fl. 4 (1924) 333; Henders., J. Mal. Br. R. As. Soc. 17 (1939) 81.

Leaves linear-lanceolate, 50-75 by 2-3 cm. Inflorescence large: to 70 cm long; flowers 4-6 together.

Found in peninsular Thailand and Langkawi only. Perhaps restricted to limestone; the collectors' labels are very brief and incomplete.

Dracaena graminifolia Wall., Cat. (1831-32) 5149; Hk.f., F.B.I. 6 (1894) 327; Ridl., Fl., 4 (1977) 333.
D. finlaysonii Bak., J. Bot. (1873) 261.

Plant to 60 cm tall. Leaves linear acuminate, about 39 by 1 cm. Raceme usually simple, sometimes branched at the base. Flowers 3-4 together, white.

Endemic to Malaya; not common in forests. Recorded from limestone only from a single locality (Gunong Rapat, Ipoh).

Dracaena nutans Ridl., Trans. Linn. Soc. 3 (1893) 406; Fl., 4 (1924) 337.
Pleomele nutans N.E. Br., Kew Bull. 8 (1914) 278.

A rare endemic to Malaya; once recorded from limestone Batu Bayan, Kelantan *(UNESCO 178)*.

Dracaena porteri Bak., J. Bot. (1873) 262; Hk.f., F.B.I. 6 (1894) 328; Ridl., Fl. 4 (1924) 333.
Pleomele porteri N.E. Br., Kew Bull. 8 (1914) 279.

Endemic to Malaya, once recorded from limestone.

Dracaena yuccaefolia Ridl., J. Bot. (1896) 168, Fl. 4 (1924) 338; Henders., J. Mal. Br. R. As. Soc. 17 (1939) 81.

Plant to 5 m tall. Leaves crowded at the end of stout twigs, stiff coriaceous, ensiform, to 40 by 2.5 cm wide, often broader. Panicle large and spreading.

Distributed in peninsular Thailand and on limestone in the extreme North of Malaya. Known only from these parts and probably restricted to limestone.

DUBIOUS RECORD

ALISMATACEAE

Echinodorus ridleyi Steen., Arch. Hydrobiol. Suppl. 11 (1932) 240; Den Hartog, Fl. Mal. I, 5 (1957) 325.
Ranalisma rostrata Stapf. in Hk. Ic. Pl. (1900) t. 2652; Ridl., Fl. 4 (1924) 362.

Distributed in Vietnam and in Malaya. Known only from 3 or 4 collections, very rare. In Malaya recorded only from Gua Batu woods, *Ridley 8464* and *Scortechini 126* (Den Hartog l.c., 326). Noted by Ridley on his label as from 'damp spot in wood': and in his Flora l.c. as 'in a patch of black mud in dense forest': this is a plant of wet places, and the aquatic more than the calcareous elements, apart from other factors unknown, probably restrict its distribution. Probably, both Ridley's and Scortechini's are not from the limestone at Gua Batu but from the surrounding forest.

AMARYLLIDACEAE

Leaves broadly ovate, petiolate	*Eurycles amboinensis*
Leaves strap-shaped, not petiolate	*Crinum defixum*

Crinum defixum Ker., Quart. J. Sci. & Art, 3 (1817) 105; Hk.f. F.B.I. 6 (1894) 281; Ridl., Fl. 5 (1925) 301; Henders., J. Mal. Br. R. As. Soc. 17 (1939) 81.

Eurycles amboinensis (L.) Loud., Encycl. Pl. (1829) 242; Back. & Bakh. f., Fl. Java 3 (1968) 140.
Eurycles sylvestris Salisb., Trans. Hort. Soc. 1 (1812) 337; Ridl., Fl. 4 (1924) 303; Henders., J. Mal. Br. R. As. Soc. 17 (1939) 81.

ARACEAE

1. Plants prickly 2
   Plants not prickly 3

2. Leaves sagittate, the 2 basal lobes triangular; spathe broad, slightly longer than spadix .... *Cyrtosperma lasioides*
   Leaves deeply incised, with 4-8 pairs of lobes; spathe narrow, much longer than spadix .... *Lasia aculeata*

3. Plants aquatic, often completely submerged; on sandy, gravelly or rocky stream beds 4
   Plants not aquatic, rarely on dripping boulders, but never completely submerged 6

4. Limb of spathe spirally twisted; leaves purple-reddish below; plants often forming dense mats on stream bed .... *Cryptocoryne affinis*
   Limb of spathe not twisted 5

5. Limb of spathe 1.3-2.5 cm long; leaves to 7-8 by 4 cm .... *Cryptocoryne purpurea*
   Limb of spathe ±0.6 cm long; leaves to 5 by 2 cm; a smaller plant .... *Cryptocoryne minima*

6. Stem short or long, erect or subterranean, or sometimes prostrate, but not climbing, not rooting from the nodes or internodes 7
   Stem usually long, climbing, rooting from the nodes or from both nodes and internodes 29

7. Plant with 1-2 leaves 8
   Plant with more than 2 leaves 14

8. Leaf blade entire, ovate and cordate; margin undulate .... *Hapaline brownei*
   Leaf blade lobed 9

9. Leaf trifoliate, leaflets simple and entire; a second leaf often present; spadix with filiform appendage 10
   Leaf usually more divided; always single; spadix without filiform appendage 11

10. Spadix much longer than spathe; with filiform appendage protruding .... *Arisaema fimbriatum*
    Spadix not longer than spathe, appendage not protruding .... *Arisaema roxburghii*

11. Appendage of spadix massive, conic 12
    Appendage of spadix long and cylindrical 13

12. Limb of spathe yellow; petiole to 200 cm long .... *Amorphophallus prainii*
    Limb of spathe pinkish; petiole to 40 cm long .... *Amorphophallus carnosus*

13. Peduncle to 30 cm long; leaf trifid with oblong-lanceolate leaflets .... *Amorphophallus haematospadix*
    Peduncle 90-120 cm long; leaf trifid with pinnatisect lobes .... *Amorphophallus variabilis*

14. Spadix with a conical or cylindrical appendage projecting above the male flowers 15
    Spadix not projecting above the male flowers 20

15. Plant small, petioles 1-12 cm long 16
    Plant usually much larger, petioles at least 20 cm long, often much more 17

16. Plant with small underground tuber; petioles 5-12 cm long .... *Typhonium filiforme*
    Plant without tuber, stem supported by short stilt roots, petioles about 1 cm long .... *Typhonium fultum*

17. Spathe slightly constricted below the middle, upper half narrow; peduncles less than 10 cm long .... *Schismatoglottis mutata*
    Spathe prominently constricted, the upper half broad; peduncles usually more than 10 cm long 18

18. Fruit drupaceous; seeds 1-3; leaves often pointing upwards 19
    Fruit a berry; seeds numerous; leaves often pointing downwards. Large plant, leaves usually more than 100 cm long .... *Colocasia gigantea*

19. Leaves dark green, veins and margin white; styles distinct .... *Alocasia lowii*
    Leaves without prominent white veins and margin; stigma sessile .... *Alocasia denudata*

20. Spathe boat-shaped, the whole dropping off as the fruit develops 21
Spathe either with a constriction in the middle or if boat-shaped, then persistent 22

21. Stem erect, 30-60 m tall; spadices several together; peduncles 10-12 cm long .... *Aglaonema oblongifolium*
Stem (rhizome) short creeping; spadix solitary; peduncles about 7 cm long .... *Aglaonema costatum*

22. Spathe with a constriction, the upper half soon falling off 23
Spathe with or without a constriction, the upper half persistent 24

23. Upper half of spadix club-shaped; leaves not peltate .... *Schismatoglottis calyptrata*
Upper half of spadix not club-shaped; leaves peltate .... *Colocasia esculenta*

24. Leaves ovate or lanceolate 25
Leaves cordate or sagittate 27

25. Spathe 2.5-3 cm long, green, peduncles about 4 cm long; stem of plant to 12 cm long .... *Homalomena griffithii*
Spathe ±1.2 cm long; leaves silvery or velvety 26

26. Leaf base asymmetrical, petioles to 5 cm long; male part of spadix about 3 times as long as the female. Leaves silvery .... *Homalomena argentea*
Leaf base symmetrical, petioles variable, to 16 cm long; male part of spadix about twice as long as the female. Leaves velvety .... *Homalomena humilis* (sometimes)
Leaf base prominently cordate or sagittate 28

27. Leaf base slightly cordate; a small plant, stem ±2.5 cm long .... *Homalomena humilis* (sometimes)
Leaf base prominently cordate or sagittate 28

28. Leaves, petioles and spathe tinged red or red; spathe ±7 cm long. Spadix not clubbed .... *Homalomena rubra*
Leaves, petioles and spathe not so coloured; spathe ±2.5 cm long. Spadix clubbed .... *Homalomena deltoidea*

29. Adult leaves deeply lobed and sometimes perforated 30
Adult leaves not lobed, very rarely perforated 32

30. Adult leaves lobed and perforations close to and on either side of the midrib; juvenile leaves not lobed, bases overlapping; spadix shorter than spathe .... *Epipremnopsis media*
Adult leaves lobed but not perforated 31

31. Leaves lanceolate, with ±3 pairs of lobes or unlobed; spathe ±7 cm long *Raphidophara beccarii*
Leaves ovate-elliptic, with numerous lobes; spathe 12-22 cm long .... *Raphidophora korthalsii*

32. Very large climber; leaves coriaceous, ±30-90 by 15-30 cm; spathe stiff ±23-35 cm long .... *Epipremum giganteum*
Smaller climber; leaves & spathe less massive 33

33. Spadix with a stalk between the fertile part and the junction with the spathe 34
Spadix without stalk; fertile up to the junction with spathe 40

34. Leaves with 1-2 distinct veins close to and parallel with the margin; petioles often flat and broadly winged 35
Leaves not so; petioles never flat and winged, sometimes with sheaths 38

35. Petioles flat and winged; spadix globose 36
Petioles not flat or winged; spadix elongate 37

36. Peduncles up to ±2.5 cm; stalk of spadix ±0.5 cm; leaf blades elliptic .... *Pothos scandens*
Peduncles ±5 cm long; stalk of spadix ±1 cm; leaf blades narrow. Inflorescence generally larger .... *Pothos macrocephalus*

37. Leaf elliptic, petiole with a prominent 0.6-cm long knee; spadix 7-15 cm long .... *Pothos latifolius*
Leaf lanceolate, knee inconspicuous; spadix usually less than 7 cm long .... *Pothos lorispatha*

38. Petioles broadly sheathing, nearly to the top .... *Anadendrum marginatum*
Petioles not sheathing to near the top 39

39. Leaf base broad, sometimes slightly cordate; sheath to 7 cm of the petiole ....
.... *Anadendrum montanum*
Leaf base narrowed, sheath at the base of the petiole only .... *Anadendrum latifolium*

40. Leaves as wide or almost as wide as long, broadly ovate-cordate; petiole 15-30 cm long, not sheathing. Spathe ±3 cm long, boat-shaped .... *Amydrium humile*
Leaves longer than wide 41

41. Petioles prominently long sheathing, sheath persistent; peduncle enclosed by the sheaths. Fruit drupaceous, one-seeded 42
Petioles not prominently sheathing, often without sheaths; sheaths if present not persisting. Fruit a berry; seeds numerous 44

42. Spadix 10-15 cm long; stem very thick; petioles broadly winged, leaves ±25 by 6 cm ....
.... *Scindapsus perakensis*
Spadix less than 5 cm long; stem slender, ±1 cm in diameter 43

43. Leaves ovate acute, base broad; stem slender: less than 1 cm diameter; spathe 3-5 cm long, ovate
.... *Scindapsus scortechinii*
Leaves lanceolate with base acute; stem to 1 cm diameter; spathe 3-5 cm long, narrow ....
.... *Scindapsus hederaceus*

44. Spadix ±5-7 cm long; stem less than 1 cm diameter .... *Raphidophora silvestris*
Spadix more than 10 cm long; stem usually more than 1 cm diameter 45

45. Petiole more than 25 cm long; spathe to 20 cm long; stem very stout ..... *Raphidophora kunstleri*
Petiole very short, inconspicuous; spathe to 12 cm long; stem 1-1.5 cm diameter ....
.... *Raphidophora maingayi*

Aglaonema costatum N.E. Br., Gard. Chron. 1 (1892) 426; Hk.f., F.B.I. 6 (1894) 531; Ridl., Fl. 5 (1925) 100; Henders., J. Mal. Br. R. As. Soc. 17 (1939) 83.

Rhizome creeping. Leaves lanceolate to ovate-acute, base broad. Spathe ±2.5 cm long, spadix protruding.

Endemic, and apart from Hooker's reference to a collection by Curtis from Perak, known only from Langkawi; it is not certain whether this species is restricted to limestone.

Aglaonema oblongifolium Schott., Wien Zeitschr. 3 (1829) 892; Hk.f., F.B.I. 6 (1894) 528; Ridl., Fl. 5 (1925) 100.
A. nitidum Kunth., Enum. 3 (1841) 55.

Alocasia denudata Engl. in DC., Monog. Phan. 2 (1879) 507; Hk.f., F.B.I. 6 (1894) 525; Ridl., Fl. 5 (1925) 97.
A. longiloba Miq., in Hk.f., F.B.I. 6 (1894) 527; Henders., J. Mal. Br. R. As. Sco. 17 (1939) 83.

Alocasia lowii Hk.f., Bot. Mag. 3 (19) (1863) t.5376; Ridl., Fl. 5 (1925) 98; Henders., J. Mal. Br. R. As. Soc. 17 (1939) 83.

Amorphophallus carnosus Ridl., J. Str. Br. R. As. Soc. 41 (1904) 47; Fl. 5 (1925) 94; Henders., J. Mal. Br. R. As. Sco. 17 (1939) 83.

Tuber small; petiole about 35 cm tall; spathe about 12 cm long.

Found only in northern Malaya and the southern part of peninsular Thailand, all records are from limestone.

Amorphophallus haematospadix Hk.f., F.B.I. 6 (1894) 517; Ridl., Fl. 5 (1925) 94; Henders., J. Mal. Br. R. As. Soc. 17 (1939) 83.

Tubers to 6 cm diameter; petioles to 60 cm long, thick. Peduncle about 25 cm long; spathe to 13 cm long.

Distributed in northern Malaya and peninsular Thailand and probably restricted to limestone although the records are not clear. Hooker referred to a specimen collected by Curtis as doubtfully from Penang where there are no limestone outcrops.

Amorphophallus prainii Hk.f., F.B.I. 6 (1894) 516; Ridl., Fl. 5 (1925) 94; Henders., J. Mal. Br. R. As. Soc. 17 (1939) 83.

The commonest forest species. Recorded from limestone in Pahang, Kelantan (fide Henderson) and doubtfully from Selangor.

Amorphophallus variabilis Bl., Rumphia, 1 (1837) 146; Ridl., Fl. 5 (1925) 95; Henders., J. Mal. Br. R. As. Soc. 17 (1939) 83.
Amorphophallus elatus Hk.f., F.B.I. 6 (1894) 517.

Amydrium humile Schott, Ann. Mus. Bot. Lugd. Bat. 1 (1863) 127; Ridl., Fl. 5 (1925) 118; Henders., J. Mal. Br. R. As. Soc. 17 (1939) 83.
Epipremum humile Hk.f., F.B.I. 6 (1894) 549.

Anadendrum latifolium Hk.f., F.B.I. 6 (1894) 540; Ridl., Fl. 5 (1925) 115.

Endemic to Malaya, not common in forest; with one record from limestone, climbing over rocks (Gua Panjang, Kelantan, *Henderson 19600*).

Anadendrum marginatum Schott, Oestr. Bot. Wochenbl. (1857) 116; Hk.f., F.B.I. 6 (1894) 540; Ridl., Fl. 5 (1925) 116; Henders., J. Mal. Br. R. As. 17 (1939) 83.

Anadendrum montanum Schott, Bonplandia 5 (1857) 45; Hk.f., F.B.I. 6 (1894) 540; Ridl., Fl. 5 (1925) 115; Henders., J. Mal. Br. R. As. Soc. 17 (1939) 83.

Arisaema fimbriatum Mast., Gard. Chron. 2 (1884)) 680; Hk.f., F.B.I. 6 (1894) 502; Ridl., Fl. 5 (1925) 89; Henders., J. Mal. Br. R. As. Soc. 17 (1939) 83.

Tuberous. Leaves 2, petioles 15-25 cm long. Spathe to 15 cm, the free part bent forwards.

Distributed in peninsular Thailand; in Malaya, apparently restricted to limestone; not uncommon, in partly shaded to fairly exposed situations.

Arisaema roxburghii Kunth., Enum. 2 (1837) 18; Hk.f., F.B.I. 6 (1894) 497; Ridl., Fl. 5 (1925) 88; Henders., J. Mal. Br. R. As. Soc. 17 (1939) 83.

Colocasia esculenta (L.) Schott, in Schott & Endlicher, Melet. Bot. 1 (1832) 18.
C. antiquorum Schott, in Schott & Endlicher, Melet. Bot. 1 (1832) 18; Hk.f., F.B.I. 6 (1894) 523; Ridl., Fl. 5 (1925) 96.

Distributed throughout the hot tropics; often cultivated; preferring moist ground. Once collected from limestone under shade, probably an escape from nearby farms (Gunong Ginting, Perak, *Mahmud* s.n.).

Colocasia gigantea (Bl.) Hk.f., F.B.I. 6 (1894) 524; Ridl., Fl. 5 (1923) 96; Henders., J. Mal. Br. R. As. Soc. 17 (1939) 84.

A common species, locally abundant by forest fringes and on limestone; tolerates extreme exposure, but does best under light shade in places with accumulation of some soil and organic debris. In 1970 on Gua Musang, Kelantan it was observed as a pioneer, after fire had destroyed the original vegetation.

Cryptocoryne affinis N.E. Br., in Hk.f., F.B.I. 6 (1894) 494; Ridl., Fl. 5 (1925) 87.

Endemic to Malaya, locally abundant, forming mats on gravelly, shallow stream beds. Once collected growing on limestone debris mixed with much non-calcareous gravel on a shallow stream bed. (Sungei Merapoh, Pahang, *Chin 1480).*

Cryptocoryne minima Ridl., J. Str. Br. R. As. Soc. 54 (1910) 61; Fl. 5 (1925) 88.

A rare endemic previously only known from Tapah, Perak (Ridley, l.c.), rooted in mud. Recently collected from Kelantan, rooted on limestone on the bed of a shallow stream (Gua Batu Boh, Kelantan, *UNESCO 279*).

Cryptocoryne purpurea Ridl., J. Str. Br. R. As. Soc. 46 (1905) 44, Fl. 5 (1925) 87.

Endemic, found in slow forest streams in Johore. Now known from Kelantan, growing on limestone rocks on a shallow stream bed (Gua Panjang, Kelantan, *UNESCO 607*).

Cyrtosperma lasioides Griff., Itin. Not. 3 (1851) 149; Hk.f., F.B.I. 6 (1894) 551.

A plant of open swampy places. Recorded once from limestone, at the base of Kota Glanggi. *(Henderson 22506).*

Epipremnopsis media Engl., Pflanz., 4. 23b (1908) 1; Ridl., Fl. 5 (1925) 120; Henders., J. Mal. Br. R. As. Soc. 17 (1939) 84.
Anadendrum medium Schott in Hk.f., F.B.I. 6 (1894) 540.

Epipremnum giganteum Schott, Bonplandia, 5 (1857) 45; Hk.f., F.B.I. 6 (1894) 548; Ridl., Fl. 5 (1925) 119; Henders., J. Mal. Br. R. As. Soc. 17 (1939) 84.
Raphidophora gigantea Ridl., Mat. 3 (1907) 44.

Hapaline brownii Hk.f., F.B.I. 6 (1894) 521; Ridl., Fl. 5 (1925) 96; Henders., J. Mal. Br. R. As. Soc. 17 (1939) 84.

Plant with a small tuber. Petiole to about 18 cm long, blade ovate-cordate, bullate; margin undulate. Spathe about 7 cm long.

Distributed in peninsular Thaïland and Malaya. Restricted to the limestone field; recorded from Kedah and Kelantan only.

Homalomena deltoidea Hk.f., F.B.I. 6 (1894) 536; Ridl., Fl. 5 (1925) 105.

Endemic, found in the forest of Johore, Perak and Kelantan; recorded from limestone in Johore and Kelantan. A plant of shady places.

Homalomena griffithii Hk.f., F.B.I. 6 (1894) 534; Ridl., Fl. 5 (1925) 106; Furt., Gards. Bull. S.S. 10 (1939) 194.

Homalomena humilis (Jack) Hk.f., var. *pumila* (Hk.f.) Furt., Gard. Bull. S. S. 10 (1939) 203; Henders., J. Mal. Br. R. As. Soc. 17 (1939) 84.
H. johorensis Engl., Ridl., Fl. 5 (1925) 106.
H. pumila Hk.f., F.B.I. 6 (1894) 535.
H. purpurascens var. *pumila* (Hk.f.) Ridl., Fl. 5 (1925) 105.

Homalomena rubra Hassk., Decad. (1842) 60; Furt., Gard. Bull. S.S. 10 (1925) 218.
H. coerulescens Jungh. ex Schott, Hk.f., F.B.I. 6 (1893) 218; Ridl., Fl. 5 (1925) 104.
H. singaporensis Regel., in Ridl., Fl. 5 (1925) 110.

Lasia aculeata Lour. Fl. Cochinch. (1790) 81; Ridl., Fl. 5 (1925) 125.
L. heterophylla Schott, Hk.f., F.B.I. 6 (1894) 550.
L. spinosa Thw., Enum. (1864) 336; Henders., J. Mal. Br. R. As. Soc. 17 (1939) 84.

A plant of wet marshy areas which has been found growing in the more sheltered localities at hill bases on limestone.

Pothos latifolius Hk.f., F.B.I. 6 (1894) 554; Ridl., Fl. 5 (1925) 129.
P. maingayi Hk.f., l.c. 554.
P. kunstleri Hk.f., l.c. 554.

Endemic to Malaya; not uncommon in the lowland forest, with one record from limestone, climbing over rocks (*Furtado* s.n. 4th June 1937 from Gunong Baling, Kedah).

Pothos lorispatha Ridl., J. Str. Br. R. As. Soc. 86 (1922) 310, Fl. 5 (1925) 130; Henders., J. Mal. Br. R. As. Soc. 17 (1939) 84.

A slender climber, leaves lanceolate, to 30 cm long. Spathe to 10 cm long. Spadix slender, cylindric.

Endemic to limestone and recorded only from Gua Batu in Selangor.

Pothos macrocephalus Scort. ex Hk.f., F.B.I. 6 (1894) 553; Ridl., Fl. 5 (1925) 128; Henders., J. Mal. Br. R. As. Soc. 17 (1939) 84.

Stem long-climbing, slender, to 0.5 cm in diameter. Leaves lanceolate, broader than petiole. Spathe ovate, to 1.5 cm long; spadix stipitate, globose.

Endemic to Malaya and common on limestone, climbing over rocks and trees. (Gunong Baling, Kedah, *Furtado* s.n.).

Pothos scandens L., Sp. Pl. (1753) 968; Hk.f., F.B.I. 6 (1894) 551; Ridl., Fl. 5 (1925) 127; Henders., J. Mal. Br. R. As. Soc. 17 (1939) 84.

Collected several times from limestone; not as common as *P. macrocephalus*.

Raphidophora beccarii Engl., Bot. Jahrb. 1 (1881) 181; Hk.f., F.B.I. 6 (1894) 546; Ridl., Fl. 5 (1925) 124.

Raphidophora korthalsii Schott, Ann. Mus. Bot. Lugd.-Bat. 1 (1863) 129; Hk.f., F.B.I. 6 (1894) 548; Ridl., Fl. 5 (1925) 124.

Raphidophora kunstleri Hk.f., F.B.I. 6 (1894) 546; Ridl., Fl. 5 (1925) 123.

Stem thick: 7-10 cm in diameter; leaves oblong-lanceolate 20-35 cm long. Spathe long, 15-20 cm, cylindric.

This is an endemic species. The type specimen was collected from Larut, Perak and quoted by Ridley as from between 1500 and 2500 m. This must be a mistake as the hills there do not rise beyond 1500 m. Apart from this, all other collections of this species are from limestone and restricted to Perak.

Raphidophora maingayi Hk.f., F.B.I. 6 (1894) 543; Ridl., Fl. 5 (1925) 123; Furt., Gard. Bull. S.S. 8 (1935) 153; Henders., J. Mal. Br. R. As. Soc. 17 (1939) 84.

Endemic to Malaya; not uncommon in forests, recorded from limestone in Selangor and Johore.

Raphidophora silvestris (Bl.) Engl. in DC., Monogr. Phan. 2 (1879) 239; Furt., Gard. Bull. S.S. 8 (1935) 156.
R. wrayi Hk.f., F.B.I. 6 (1893) 544; Ridl., Fl. 5 (1925) 122.

A species usually found in the hills above 1000 m. Recorded from limestone on Gua Batu, Selangor *(Ridley s.n., Dec. 1896 & Nur 8965).*

Schismatoglottis calyptrata Zoll. & Morr., Syst. Verz. Ind. Archip. (1854) 83; Ridl., Fl. 5 (1925) 111.
S. longipes Miq., Hk.f., F.B.I. 6 (1894) 538.

Schismatoglottis mutata Hk.f., F.B.I. 6 (1894) 538; Ridl., Fl. 5 (1925) 111; Henders., J. Mal. Br. R. As. Soc. 17 (1939) 84.

Endemic to Malaya, found in lowland forests and on limestone, rare. The limestone records are from Gua Batu, Selangor and Pahang.

Scindapsus hederaceus Schott, Bonplandia, 5 (1857) 45; Hk.f., F.B.I. 6 (1894) 542; Ridl., Fl. 5 (1925) 117.

Scindapsus perakensis Hk.f., F.B.I. 6 (1894) 542; Ridl., Fl. 5 (1925) 118; Furt., Gard. Bull. S.S. 8 (1935) 157; Henders., J. Mal. Br. R. As. Soc. 17 (1939) 84.

Scindapsus scortechinii Hk.f., F.B.I. 6 (1894) 541; Ridl., Fl. 5 (1925) 117.

Usually found above 900 m. Once collected from limestone at an elevation of 200 m (Gua Serai, Kelantan, *UNESCO 437*).

Typhonium filiforme Ridl., J. Str. Br. R. As. Soc. 41 (1905) 45, Fl. 5 (1925) 91; Henders., J. Mal. Br. R. As. Soc. 17 (1939) 84.

Plant with a small tuber. Leaves 2-3, sagitate, 5-8 cm long. Spadix with a long appendage.

Rare, endemic to limestone. Recorded from Perak and Perlis; the Perlis specimen is tentatively identified as this. Known only from these two collections *(Henderson:* Kuala Dipang, Perak, *9620* and Bukit Lagi, Perlis, *22824).*

Typhonium fultum Ridl., J. Str. Br. R. As. Soc. 41 (1905) 45; Fl. 5 (1925) 91; Henders., J. Mal. Br. R. As. Soc. 17 (1939) 84.

Plant nontuberous; leaves ovate-cordate to sagitate, 5-7 by 5 cm. Spadix as long as the spathe.

Rare, endemic to the limestone. Recorded from Langkawi, Selangor and Pahang in shady moist localities.

Dubious record

Homalomena argentea Ridl., J. Bot. 49 (1902) 35, Fl. 5 (1925) 107; Furt., Gard. Bull. S.S. 10 (1939) 186.

A small plant, stem about 2 cm long. Petioles pinkish red, leaves elliptic. Spathe 1.2-1.3 cm long, spadix slightly shorter.

A rare endemic found in the South of Malaya, previously recorded only from Malacca, now known from Johore *(Chin 648),* growing in a small pocket of soil on a small limestone outcrop. This soil appears to be derived from sandstone and is not of calcareous origin.

BURMANNIACEAE

1. Ovary uni-loculate; placentation parietal, flowers pale violet .... *Gymnosiphon aphyllus*
   Ovary tri-loculate; placentation axile, flowers white 2

2. Perianth tube winged, flowers numerous .... *Burmannia lutescens*
   Perianth tube not winged, flowers 4-5 .... *Burmannia championii*

Burmannia championii Thw., Enum. Pl. Zeyl. 5 (1864) 325; Hk.f., F.B.I. 5 (1893) 666; Ridl., Fl. 4 (1924) 306; Jonker, Fl. Mal. I, 4 (1948) 17.

Rare and known from only 3 records in Malaya. The first (*Ridley*, l.c.) was from Selangor forest by the Labu River; "in damp woods deeply buried in decaying leaves." (This record is not noted by Jonker l.c.). Recently this species has been collected over limestone, in shady hollows with rich humus, in Kelantan *(UNESCO 50)* and Selangor *(Chin 1829).* I collected the Selangor specimen in flower on 23rd July 1972; in November 1972, I saw no flowering shoots above ground level. This periodic appearance of above-ground parts and the relatively inconspicuous plant body have probably played an important part in the apparent rarity of this species.

Burmannia lutescens Becc., Malesia 1 (1877) 246; Jonker, Fl. Mal. 1, 4 (1948) 19. *B. gracilis* Ridl., J. Str. Br. As. Soc. 22 (1890) 335, Fl. 4 (1924) 305; Henders., J. Mal. Br. R. As. Soc. 17 (1939) 74.

Gymnosiphon aphyllus Bl., Enum. Pl. Jav. 1 (1827) 29. Ridl., Fl. 4 (1924) 306; Jonker, Fl. Mal. I, 4 (1928) 20.

Throughout the lowland forests but uncommon. Recorded from over limestone once (Batu Hayan, Kelantan, *UNESCO 73*).

NOTE

BUTOMACEAE

Limnocharis flava (L.) Buchenau.

Native of tropical America, now naturalised and common in SE. Asia; in wet places. Recorded from Lenggong, Perak, near padi fields, growing in streams underlain by limestone.

COMMELINACEAE

1. Inflorescence terminal 2
   Inflorescence axillary 7

2. Plant a small slender creeping herb to 20 cm tall. Fruits, dehiscent capsules, not blue. Rare on limestone and recorded only from Langkawi 3
   Plant larger, often erect to 60 cm or more tall (except for *Pollia sumatrana* which is ±30 cm tall but which is densely rusty-red pubescent). Fruits indehiscent, blue. Uncommon on limestone and not recorded from Langkawi 4

3. Leaves pubescent beneath; ovary with a single locule and ovule. Very rare, recorded from Malaya only once; on limestone in Langkawi .... *Aneilema subovatum*
   Leaves not pubescent beneath; ovary with 3 locules and 3-6 ovules. Common weed, recorded from limestone in Langkawi .... *Aneilema nudiflorum*

4. Inflorescence with flowers densely clustered in heads, leaves 25-40 by 7-10 cm. *Pollia thyrsiflora*
   Inflorescence with flowers spaced out; not in heads 5

5. Inflorescence with peduncle, 4-9 cm long; flowers few. From Perak and the North 6
Inflorescence with peduncle, 13-20 cm long; flowers numerous. Recorded only from Kelantan .... *Pollia sorzogonensis*

6. Leaves pubescent beneath; sepals pubescent. Inflorescence to ± 5 cm long. Very rare, recorded from limestone only in Perak .... *Pollia sumatrana*
Leaves glabrous beneath, sepals glabrous. Inflorescence ± 8 cm long. Recorded from limestone in Kedah .... *Pollia subumbellata*

7. Stem herbaceous, succulent, erect, short or to 30 cm tall; leaves linear lanceolate. Inflorescence subtended by spathe-like leafy bract. An escape from cultivation .... *Rhoeo spathacea*
stem semi-woody, creeping ascending, to 100 cm long; leaves broadly elliptic. Inflorescence not subtended by leafy bract .... *Forrestia monosperma*

Aneilema nudiflorum Br., Prodr. (1810) 271; Ridl., Fl. 4 (1924) 355.

A common and widely distributed weed in waste ground and on sandy places. Collected once, growing from limestone crevices. (Kuah, Langkawi *Samat 3).*

Forrestia monosperma CI., Bull. Herb. Boiss. 6 (1898) 359; Ridl., Fl. 4 (1924) 360.

Endemic to Malaya; found in rocky forests, in moist places under shade. Recorded from limestone in Kelantan and Pahang.

Pollia sorzogonensis Endl., Gen. P1. 13 (1840) 1029; Ridl., Fl. 4 (1924) 350.

Pollia subumbellata Cl., J. Linn. Soc. Bot. 9 (1866) 451; Ridl., Fl. 4 (1924) 350; Henders., J. Mal. Br. R. As. Soc. 17 (1939) 82.

Herb, stem ascending to 90 cm. Leaves thin, glabrous, 8-10 by 2.5 cm. Inflorescence with a 5-cm peduncle, the whole about 9 cm long.

Distributed in the eastern Himalayas and Burma. Confined to the limestone of Kedah and Perlis in Malaya, except (according to Henderson l.c.) for a doubtful specimen from Tembeling in Pahang.

Pollia sumatrana Hassk., Commel. Ind. (1870) 57; Ridl., Fl. 4 (1924) 350.
Very rare in Malaya, once from limestone. (Gunong Pondok, Perak, *Burkill & Haniff, 13907).*

Pollia thyrsiflora Endl., Gen. Pl. 13 (1840) 1029; Ridl., Fl. 3 (1924) 350; Henders., J. Mal. Br. R. As. Soc. 17 (1979) 82.

Rhoeo spathacea (Sw.) Stearn, Baileya 5 (1957) 198; Stone, Micronesica 6 (1970) 105.
R. discolor (L'Heritier) Hance, Ann. Bot. Syst. 3 (1852) 660.

This plant, a native of Central America, is commonly found cultivated in gardens in Malaya. Recently it has been found growing abundantly on one of the western cliff faces on Gunong Rapat in Perak. The plants were growing from cracks and crevices on the ground and up the cliff face. These probably originate from nearby Chinese gardens where they are cultivated for use in local medicine.

Dubious record

Aneilema subovatum Ridl., Fl. 4 (1924) 357; Henders., J. Mal. Br. R. As. Soc. 17 (1939) 82.

Uncommon, recorded only from Langkawi and Perlis. According to Henderson l.c., a doubtfully determined specimen *(Henderson 22822)* is from limestone in Langkawi.

CYPERACEAE

1. Flowers bisexual 2
Flowers unisexual, female flowers usually below the male 8

2. Inflorescence always subtended by a whorl of leaflike bracts; bracts more than 5 cm long, narrow, the inflorescence then a single head of spikelets or wide: ± 1 cm, then inflorescence an umbel with many unequal radiating branches. Styles persistent and not thickened at the base 3
Inflorescence not always subtended by a whorl of leaflike bracts; bracts usually < 5 cm long. Inflorescence not with the above combination of characters. Styles deciduous, thickened at the base and articulated with the nut 4

3. Inflorescence a single head of spikelets at the end of stems. Leaves narrow ..... *Cyperus kyllingia*
Inflorescence an umbel of many unequal branches. Leaves broader: to 1 cm .... *Cyperus trialatus*

4. Glumes spirally arranged. Plant densely tufted. Inflorescence, an umbel of 4 or 5 branches, each with 1 spike. Central sessile spike present at the base of the umbel *Fimbristylis trichophylla*
Glumes in 2 raws, distichous; not as pronounced in mature spikelets 5

5. Leaves very narrow: 0.5-1 mm. Glumes densely gland-dotted and nuts smooth or if glumes not gland-dotted then nuts finely striate with faint transverse lines 6
Leaves wider: 1.5-2.4 mm. Glumes not densely gland-dotted, nuts differently marked or smooth 7

6. Glumes densely gland-dotted; styles hairy at the base; nuts smooth. Plant densely tufted, leaves rigid, tips acute, scabrid at the top .... *Fimbristylis fuscoides*
Glumes not gland-dotted; styles glabrous; nuts longitudinally striate. Plant slender, tufted, leaves not rigid. Endemic to the Langkawi limestone .... *Fimbristylis calcicola*

7. Nuts densely warty; leaves abruptly pointed .... *Fimbristylis fusca*
Nuts completely smooth; leaves obtuse. Endemic to Langkawi limestone *Fimbristylis malayana*

8. Plant with leaves mainly from the base. Carpellate flowers and nuts enclosed by a modified glume (utricle) 9
Plant with leafy stems. Carpellate flowers and nuts not enclosed by a modified glums 12

9. Inflorescence a narrow oblong panicle, occupying the upper third of stem. Stems 60-120 cm tall .... *Carex perakensis*
Inflorescence not a panicle. Stems usually much shorter: 4-55 cm tall 10

10. Spikes forming ovoid or globose heads, 0.5-1 cm long by 0.8-1.5 cm broad. Leaves very few, 0.2-0.6 cm wide .... *Carex malaccensis*
Spikes not forming heads; leaves numerous 11

11. Spikes 1-3, singly at nodes, well spaced mixed (androgynous), female below and male above .... *Carex speciosa*
Spikes 5-7; spaced or sometimes close together; rarely to 20 through branching. Terminal: male, remainder: female or mixed .... *Carex breviscapra*

12. Plant slender, stem 0.1-0.2 cm thick, less than 60 cm tall. Leaves singly on stems .... *Scleria lithosperma*
Plant fairly stout, stem ± 0.5 cm thick, and ± 100 cm tall. Upper leaves in groups of 2-6, about 5 cm apart .... *Scleria multifoliata*

Carex breviscapa C.B. Cl., in Hk.f., F.B.I. 6 (1894) 736; Nelmes, Reinw. 1 (1961) 369.
C. curtisii Ridl., Fl. 5 (1925) 183.

Very rare in Malaya. Known from two collections (non-limestone). A further recent collection from Batu Hayan, Kelantan *(UNESCO 56)* is referred to this species with some doubts.

Carex malaccensis C.B. Cl., in Hk.f., F.B.I. 6 (1894) 722; Nelmes, Reinw. 1 (1951) 257; Ridl., Fl. 5 (1925) 183; Henders., J. Mal. Br. R. As. Soc. 17 (1939) 85.

Tufted. Stem to 50 cm tall, slender. Leaves few, 2-6 mm wide. Inflorescences of 1-4 crowded sessile spikes, each forming subglobose or ovoid heads, whitish; bracteoles aristate.

Endemic to the limestone in Langkawi, not uncommon in partially sheltered localities, growing from rock crevices and on soil.

Carex perakensis C.B. Cl., in Hk. f., F.B.I. 6 (1894) 720; Nelmes, Reiw. 1 (1951) 253; Ridl., Fl. 5 (1925) 184.

Carex speciosa Kunth., Enum. Pl. 2 (1837) 504; Nelmes, Reinw. (1951) 390.

Tufted. Stems slender, 5-50 cm tall, 0.5-1.5 mm thick. Leaves numerous, longer than stems, 3-11 mm wide. Inflorescence with 1-3 spikes well spaced out on the stem, singly from nodes. Each 1-4 cm long, with female flowers in the lower half and male flowers in the upper. Utricles trigonous, ventral face wider than each half of the angled dorsal face.

A new record for Malaya. Distributed in Sumatra and Java. In Java this species has been extensively and frequently collected from calcareous marl. Found in the lowlands and up the hills to more than 1000 m. The Malayan records are all from limestone and so far only from Kelantan and Pahang. It is not an uncommon plant on the Kelantan limestone. Two numbers, *Chin 436* and *1378* are referred to this species with some doubt: their spikes are longer, to 7 cm, and they bear leaves towards the narrow range of its variation, being 3-4 mm wide; in these respects more like *C. stenura* Nelmes which is a rare endemic in the southern division of Borneo. Apparently *C. speciosa* Kunth and *C. stenura* Nelmes, which are the only two species in section Radicales Nelmes, are very similar. Further, Nelmes l.c., has also stated that *C. speciosa* is very polymorphic throughout its range, so perhaps examination of plants from its former geographical range and of recent collections from its new distributional extension would throw additional light on the taxonomy of the section Radicales.

The Malayan records were material growing from rock crevices which had some accumulation of dark red calcareous soil, under partially sheltered conditions. All were from less than 250 m elevation: Gua Serai, Kelantan *UNESCO 314;* Gua Panjang, *UNESCO 508* & Gua Musang, *Chin 1378;* Pahang; Bukit Chintamani, *Chin 436.*

Cyperus kyllingia Endl., Cat. Hort. Acad. Vindob. 1 (1842) 94; Back. & Bakh. f, Fl. Java 3 (1968) 469; Stone, Micronesica 6 (1970) 170.
Kyllingia monocephala Rottb., Desc. Ic. Rar. Pl. (1773), 13, t. 4, f. 4; Ridl., Fl. 5 (1925) 138.

Distributed all over the tropics; in Malaya a common weed of wayside and waste ground, tolerating extreme exposure and poor soils. Once recorded from limestone, (Gunong Rapat, Perak, *Molesworth-Allen 4271.*).

Cyperus trialatus (Boeck.) Kern., Reinw. 3 (1954) 32.
C. bancanus Miq., Ridl., Fl. 5 (1925) 143.
C. turgidulus C.B. Cl. ex Hk. f., F.B.I. 6 (1893) 601.

Fimbristylis calcicola Kern, Blumea 8 (1955) 129, ibid., 15 (1967) 439.

Tufted. Stems very slender, to 20 cm tall. Leaves 0.5-1 mm wide. Inflorescence with 3-9 spikelets, bracts setaceous. Nut oblong-ovoid, ± 0.6 mm long.

Endemic to the limestone on Pulau Langkawi and so for known only from a single collection (*Corner* s.n. 19th Nov. 1941).

Fimbristylis fusca (Nees) C.B. Cl., F.B.I. 6 (1893) 649; Kern, Blumea 15 (1967) 435.

Fimbristylis fuscoides C.B. Cl., Kew Bull. add. ser. 8 (1908) 25; Ridl., Fl. 5 (1925) 160; Henders., J. Mal. Br. R. As. Soc. 17 (1939) 86.

Rare in Malaya and only known from Langkawi and Perlis. The Perlis specimens are from open 'heath' country (not limestone), and according to Henderson l.c. the ones in Langkawi are from limestone.

Fimbristylis malayana Ohwi, Blumea 8 (1955) 96; Kern, Blumea 15 (1967) 438.

Tufted. Stems slender, 20-40 cm tall. Leaves much shorter than the stems, tips obtuse, 1.5-2 mm wide. Inflorescence simple sub-compound, with 2-7 spikelets. Spikelets 8-10 by 2-2.5 mm. Nut smooth, obovoid.

Endemic in Pulau Langkawi, on the limestone, known only from 3 collections.

Fimbristylis trichophylla Ridl., Fl. 5 (1925) 155; Henders., J. Mal. Br. R. As. Soc. 17 (1939) 86.

Tufted. Stems slender, 15-30 cm tall, leaves slightly shorter, filiform linear. Inflorescence an umbel of 4-5 branches, each with 1 spike, and a sessile spike in the centre of the umbel. Spike ovate, 0.2 cm long.

Thailand and Malaya. Growing from limestone rock crevices, tolerating rather exposed conditions.

Scleria lithosperma Swartz, Prodr. Veg. Ind. Occ. (1788) 18; Clarke in Hk.f., F.B.I. 6 (1893) 685; Ridl., Fl. 5 (1925) 176; Henders., J. Mal. Br. R. As. Soc. 17 (1939) 86.

Scleria purpurascens Steud., Syn. Pl. Cyp. (1855) 169; Back. & Bakh. f., Fl. Java 3 (1968) 485.
S. multifoliata Boeck. ex Hk. f., F.B.I. 6 (1984) 693; Ridl., Fl. 5 (1925) 178.

DIOSCOREACEAE

1. Stems twining to the left, the tip growing in a clockwise direction; the stem with a clockwise twist 2
   Stems twining to the right, the tip growing in an anti-clockwise direction; the stem with an anti-clockwise twist 6

2. Leaves compound; 3-foliolate, middle leaflet largest, to 30 by 28 cm .... *Dioscorea hispida*
   Leaves simple, rarely lobed 3

3. Capsules as broad or broader than long, male flowers with an enlarged torus 4
   Capsules longer than broad, torus of male flowers not enlarged, leaves usually broadly cordate, upper surface slightly bullate .... *Dioscorea bulbifera*

4. Plant glabrous; inflorescence usually cymose 5
   Plant pubescent with T-shaped hairs; inflorescence usually spicate or racemose .... *Dioscorea esculenta*

5. Leaves trifid above a cordate base; male flowers in small cymes; capsule wings nearly twice as long as wide .... *Dioscorea membranacea*
   Leaves not lobed, cordate; male flowers usually solitary; capsule wings 2½ times as long as wide .... *Dioscorea calcicola*
   Leaves ovate, elliptic or rounded, much more than 1.5 cm wide 7

7. Base of leaves on mature plants narrowed or rounded, not cordate or sagittate, male spikes erect 8
   Base of most leaves on mature plants cordate or sagittate, male spikes horizontal or pendulous 9

8. Leaves coriaceous, lanceolate-ovate to 16 by 5 cm, frequently less .... *Dioscorea laurifolia*
   Leaves herbaceous, elliptic or ovate-elliptic, to 15 by 7 cm .... *Dioscorea prainiana*

9. Leaves pubescent, at least on the petioles and the lower surface 10
   Leaves glabrous 11

10. Leaves ovate-elliptic, base slightly cordate; to 11 by 8 cm .... *Dioscorea pyrifolia*
    Leaves rounded, as broad as long, base cordate, usually 12 by 12 cm, often larger .... *Dioscorea polyclados*

11. Leaves longer than broad, ±10 by 6 cm; axis of male spikes zig-zag .... *Dioscorea filiformis*
    Leaves as broad as long, ± 10 by 10 cm; axis of male spikes not zig-zag .... *Dioscorea glabra*

Dioscorea bulbifera Linn., Sp. Pl. (1753) 1033; Ridl., Fl. 4 (1924) 315; Henders. J. Mal. Br. R. As. Soc. 17 (1939) 81; Burk., Fl. Mal. I, 4 (1951) 311.

Dioscorea calcicola Prain et Burk., Kew Bull. (1925) 64; Ridl., Fl. 5 (1925) 341 Henders., J. Mal. Br. R. As. Soc. 17 (1939) 81; Burk., Fl. Mal. I. 4 (1951), 327.

Slender climber; leaves opposite or alternate, lanceolate-acuminate, base rounded or cordate, to 12 by 1.5 cm. Male spikes from the upper leaf axils.

Distributed in Peninsular Thailand; in Malaya nearly always from limestone; recorded from Langkawi, mainland Kedah and Kelantan. The only non-limestone record is from Kedah Peak.

Dioscorea esculenta (Lour.) Burk., Gard. Bull. S. S. 1 (1917) 396; Henders., J. Mal. Br. R. As. Soc. 17 (1939) 81; Burk., Fl. Mal. I, 4 (1951) 307.
D. aculeata Linn., Ridl., Fl. 4 (1924) 315.

Widely cultivated in Malaya and over most of the tropics. Recorded from limestone in Kedah.

Dioscorea filiformia Bl., En. Pl. Java 1 (1827) 22; Burk., Fl. Mal. I, 4 (1915) 329.
D. gibbiflora Hk.f., F.B.I. 6 (1892) 294; Henders., J. Mal. Br. R. As. Soc. 17 (1939) 81.
D. myriantha Kunth, Henders., J. Mal. Br. R. As. Soc. 17 (1939) 82.

Dioscorea glabra Roxb., Fl. Ind. 3 (1832) 803; Hk.f., F.B.I. 6 (1892) 294; Ridl., Fl. 4 (1924) 318; Henders., J. Mal. Br. R. As. Soc. 17 (1939) 81.

Dioscorea hispida Dennst. in Schluss. Hort. Malab. (1818) 15; Burk., Fl. Mal. I, 4 (1951) 318.
D. triphylla Linn. Ridl., Fl. 4 (1924) 314; Henders., J. Mal. Br. R. As. Soc. 17 (1939) 82.

Dioscorea polyclades Hk.f., F.B.I. 6 (1892) 294; Ridl., Fl. 4 (1924) 315; Burk., Fl. Mal. I, 4 (1951) 334.

Dioscorea prainiana Kunth, Pfl. R. 87 (1924) 286; Burk., Fl. Mal. I, 4 (1951) 324.
D. deflexa Hk.f., F.B.I. 6 (1892) 293.

Dioscorea prazeri Prain et Burk., J. As. Soc. Beng (1904) 73; Burk., Fl. Mal. I, 4 (1951) 307.

Recorded from limestone in Perlis. Referred to by Henderson l.c. as doubtfully *D. membranacea* Pierre ex Prain et Burk.

Dioscorea pyrifolia Kunth, En. Pl. 5 (1850) 384; Hk.f., F.B.I. 6 (1892) 292; Ridl., Fl. 4 (1924) 316; Henders., J. Mal. Br. R. As. Soc. 17 (1939) 82; Burk., Fl. Mal. I, 4 (1951) 332.

Note

Dioscorea membranacea Pierre ex Prain et Burk., J.. As. Soc. Beng 10 (1914) 13; Henders., J. Mal. Br. R. As. Soc. 17 (1939) 81.

The specimen (*Henderson 22884)* doubtfully referred to as this species by Henderson l.c. is actually *D. prazeri* Prain et Burk. (which see).

This species is distributed in Thailand, Burma and Indochina and so far has not been recorded from Malaya.

FLAGELLARIACEAE

Hanguana malayana (Jack) Merr., Philip. J. Sc. 10. (1915) 3; Back. & Bakh f., Fl. Mal. I, 4 (1951) 249.
Susum malayanum (Jack) Pl. ex Hk. f., F.B.I. 6 (1892) 391; Ridl., Fl. 4 (1924) 369.